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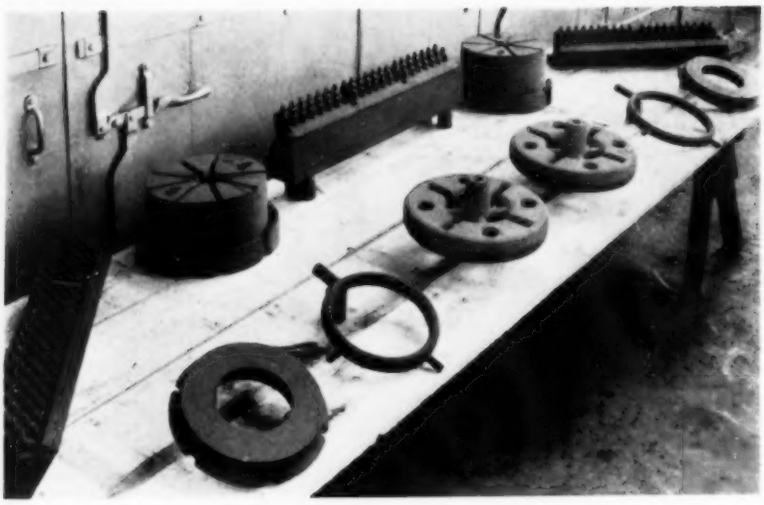

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Engineers Loom More Important In Future of Industry

TRANSITION of the foundry industry from an art to a science has progressed rather rapidly during the past decade. More and more foundrymen have realized the need for men with an engineering education, if foundry practice and product are to meet the needs of our modern industrial civilization. As a result, supervisory staffs in a great many foundries today are composed almost entirely of technically trained men, and the number of college graduates finding positions in foundries increases yearly.

In a large measure credit for that development should go to members of college and university faculties closely associated with the teaching of foundry practice. Before industry had discovered the desireability of the pedagogical product, professors already were interesting a few boys in the future of foundry industry and at the same time were trying to influence the industry in hiring these selected college boys. Gradually the idea has taken hold.

Recently foundrymen have awakened to an even more significant relationship with engineering schools. If the castings industry of the future is to prosper and progress, young engineers must be thoroughly familiar with the availability and the dependability of cast products as engineering materials of construction. As stated by Frederick A. Melmoth in his exchange paper, completed in this issue, "A designer should be familiar with the main characteristics of the metal from which his design shape will be produced, so that such knowledge on his part, has an opportunity of affecting his ultimate decisions."

For years, textbooks used in engineering schools presented the story of castings most inadequately and inaccurately. Few graduating engineers in the past left college with any clear idea of the properties and applications of castings for even a limited field. Everybody was just too busy to spend a little time and effort in selling the foundry industry for the benefit of tomorrow's business.

Today that situation is changing rapidly, with individual companies and groups endeavoring to supply engineering schools with usable and valuable data on the engineering properties and applications of castings. Through foundry meetings held at various schools and to which the students are invited; through lectures to students groups by leaders of the industry; and through handbooks and other data which may be used as classroom text material; the American Foundrymen's association, the Steel Founders Society of America, the Malleable Founders society and the Gray Iron Founders society are helping industry build for the future on the basis of knowledge. Best of all, faculty members welcome this new spirit of cooperation and trust it may continue to grow.

Foundries Are Safer

FURTHER improvement in the accident record of the foundry industry is revealed in the report of a recent survey made by the National Safety council. Frequency rate among foundries, which is the number of reportable injuries per one million man-hours of exposure, was 18.42 in 1938, and the severity rate, the number of days lost as a result of reportable injuries per one thousand man-hours of exposure, was 0.88. Compared with all industries where the frequency rate is 12.18 and the severity rate is 1.53, it would seem foundries have more accidents but these are not as severe.

The foundry industry can be proud that the frequency of accidents has decreased 43 per cent and the severity 52 per cent during the past year. As the result of much educational work and the cooperation of enlightened management, the long range comparison with all industries shows foundries in an exceptionally favorable light. Since 1926, the frequency rate of foundries has been reduced 74 per cent, as compared with a decrease of 68 per cent for all industries. Severity rate has dropped 87 per cent against a reduction of 44 per cent for all industry.

An analysis of causes shows managment's responsibility in providing further improvement in safety records. Greatest cause of accidents during the past year was being caught in between moving equipment and materials. Proper guards and most of all, education of employes in safety measures, should improve that situation. Twenty-seven per cent of all injuries were caused by falling, sliding and flying objects, and resulted from not using safety clothing and protective equipment, such as goggles and safety shoes. Reduction of accidents in that classification again becomes a problem of management. Safety equipment should be available, and its use should be mandatory.

Frank G. Steinebach
Editor

MAGNESIUM, lightest of commercial structural metals, gradually is expanding its field of application, stimulated by progressive advances in fabricating technique and lower cost of the metal itself. With only 22 per cent of the weight of steel, volume for volume, 65 per cent of the weight of aluminum and 20 per cent of the weight of brass, magnesium naturally offers advantages in aircraft parts, portable tools, truck and bus parts, as well as in such items as foundry flasks, matchplates, patterns, core boxes, assembly jigs and fixtures, which involve considerable manual handling.

Fig. 1 (Below left)—Quadrant for new Ford tractor. First made as sand casting, later to be permanent mold casting. Opposite page, top row—Fig. 2 (Left)—As casting is being poured a mixture of boric acid and sulphur is sprinkled over pouring box and riser. Fig. 3 (Right)—Spotting cores and cast iron chills in mold for aircraft supercharger housing. Middle row—Fig. 4 (Left)—Chipping, peening and light grinding of small castings on bench line. Fig. 5 (Right)—Temperature reading taken with portable thermocouple. Metal is heated to 1700 degrees and reduced to 1500 degrees Fahr. before pouring. Bottom row—Fig. 6 (Left)—Boric acid and sulphur powder are dusted over exposed surfaces of risers after pouring. Fig. 7 (Right)—Low specific gravity of magnesium requires more risers than is customary with other alloys

Rapidly Grew in Popularity

Production of the metal in this country began about 1915. Ten years later, annual output had climbed to 10,000 pounds. In 1931 that figure had mounted to 127,000 pounds and in 1936 to 792,000 pounds. This year production will be well over the million-pound level. In 1925 the cost of metallic magnesium was 86 cents per pound. The price was reduced steadily until in 1937 it was 30 cents per pound. Within the past month another reduction brought the current price to about 26 cents per pound. Relative newness of the metal has meant that as yet there is no secondary market as with aluminum. Within a few years, steadily mounting use will develop a secondary market for magnesium.

Pure magnesium is a silvery white metal, specific gravity 1.74, specific heat 0.25 and atomic weight 24.32, melting point 1204 degrees Fahr. and coefficient of thermal expansion per degree Fahr. at 65-750 degrees of 0.000016. Thermal conductivity in C.G.S. units from 100-300 degrees Cent. is 0.38.

In combination with other elements, magnesium constitutes about 2 per cent of the earth's crust. Mineral sources of the metal include magnesite, dolomite, carnallite and natural salt brines, the latter being at present the chief source of magnesium metal. Brines of that nature are found in Michigan and Ohio and contain approximately 3 per cent magnesium chloride. This is separated, dried and broken down in electrolytic cells.

Magnesium and its alloys are available to industry in several forms. Nonstructural grades include ingot, powder, wire, ribbon and strip. Structural varieties include sand castings, permanent mold castings, pressure die castings, extruded rod, extruded shapes, rolled plates and sheets, and forgings. Three sources of supply are operating at present: Dow Chemical Co., Midland, Mich., pioneer in magnesium reduction methods and now making the metal in nearly all forms; Magnesium Fabricators Inc., Adrian, Mich., division of Bohn Aluminum & Brass Corp., supplying sand and permanent mold castings; and American Magnesium Corp., Cleveland, affiliated with Aluminum Co. of America. This article will be concerned primarily with the production of magnesium sand castings at the Adrian plant of Magnesium Fabricators Inc.

Build New Foundry For Magnesium

Beginning last fall, the project was initiated as a pilot plant for sand casting magnesium, with daily capacity of 1500 pounds, comparing with 3000-pound daily capacity of American Magnesium, and 1000 pounds for Dow Chemical. The main manufacturing building or foundry 100 by 160 feet is divided by a brick wall into two sections, cleaning and trimming room, and the foundry proper. Offices and laboratory occupy an additional 25-foot section across the front. The building is of modern brick and steel construction, with ample light and ventilation from sidewall sash. At the moment a 40 x 80-foot single-story building is being erected on adjoining property for eventual use as a pattern shop, and for metal and pattern storage. These facilities will be transferred from the main building to make way for installation of a permanent mold division.

Foundry problems in connection with magnesium have a number of peculiar angles, for three chief reasons: Molten metal has a high affinity for moisture,

Molding AND

D *Casting* MAGNESIUM

By A. H. ALLEN
Detroit Editor, The Foundry

often an explosive affinity; molten metal will oxidize or burn rapidly if exposed to the open air; magnesium dust and fines form a highly combustible mixture with air. Another inherent property of magnesium is lightness and lack of hydrostatic pressure required to force the metal into cavities of molds.

Moisture Content of Sand Low

These peculiarities of the metal are not insurmountable in routine foundry practice. Affinity for moisture means that the green sand used in molding must be kept within the maximum range of 2.0-2.5 per cent in moisture content. As a further precaution, inhibitors are mixed with the sand to counteract the effect of moisture. A mixture of sulphur, sulphuric acid, borax and diethylene glycol is used, with a pure white silica sand. For molds 3 per cent by weight of bentonite clay bond is added, and in cores, using the same sand, an oil binder is used. The sand mixture must have a high permeability and when first mixed shows about 90 on the permeability measuring equipment made by H. W. Dietert Co., Detroit. With reuse, that figure runs up as high as 150. Sand of uniform grain size is employed and a careful check of permeability and moisture content is kept constantly by laboratory control methods.

Sand for molds and cores is mixed in separate units made by the National Engineering Co., Chicago. Core sand is transferred by wheelbarrows to eight wooden hoppers at the coremaking stations. Cores are washed with a mixture of flake graphite, plumbago and boric acid and are baked, usually overnight, in gas-fired ovens at 150 degrees Fahr. Four ovens are available, three accommodating two standard core racks. The fourth is a smaller quick-drying type for day service. Sand is in a closed system and after castings are shaken out falls through a grid and screen which removes foreign particles, then on to a bucket elevator which conveys it to the overhead mixers.

Four small jolt squeezers made by the Osborn Mfg. Co., Cleveland, are provided for ramming small molds. Larger molds are made on two rollover, pattern draw molding machines supplied by the Johnson & Jennings Co., Cleveland. Conventional wood patterns are made in the company's own pattern shop. Light weight of the metal calls for a number of innovations in molds. Deep copes with many risers are required. Gating is designed to obtain maximum circulation of metal as it rushes into the mold. The metal usually is poured into a sand lined wood pouring box from which it descends into a rectangular shaped sprue in the mold. On a large casting, the weight of gates and risers often is three times the finished weight of the casting itself.

Metal Melted in Oil Fired Furnaces

Metal is melted in six oil-fired furnaces made by the United States Furnace Co., Bellevue, Ill., accommodating either 100-pound or 200-pound pots formed of ⅜-inch boiler plate, arc welded and dished at the bottom. Sides have a slight taper and lugs are welded on at the upper rim to facilitate handling. They show an average life of approximately 50-60 heats. Charge comprises virgin metal and a portion of return scrap. After the charged pots are placed in the furnace, temperature is brought up to 1700 degrees Fahr., requir-

(*Please turn to page* 56)

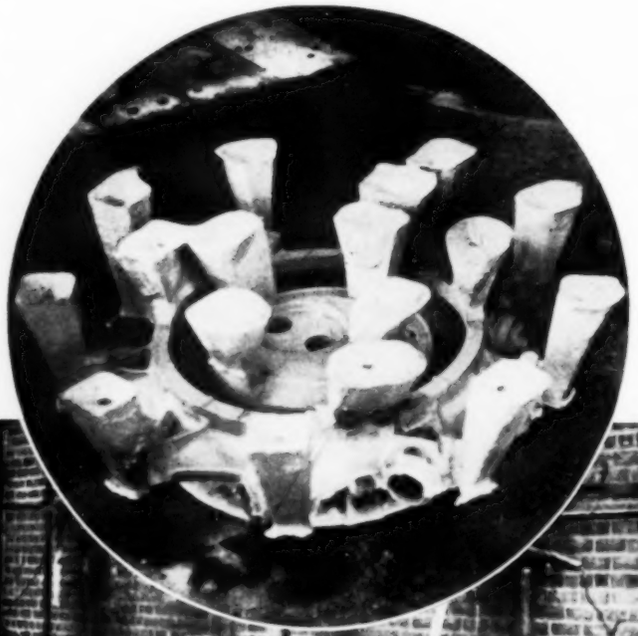

Fig. 8 (Right)—Seventeen risers are required on supercharger housing casting. Ratio of scrap to finished casting weight often is as high as 3 to 1

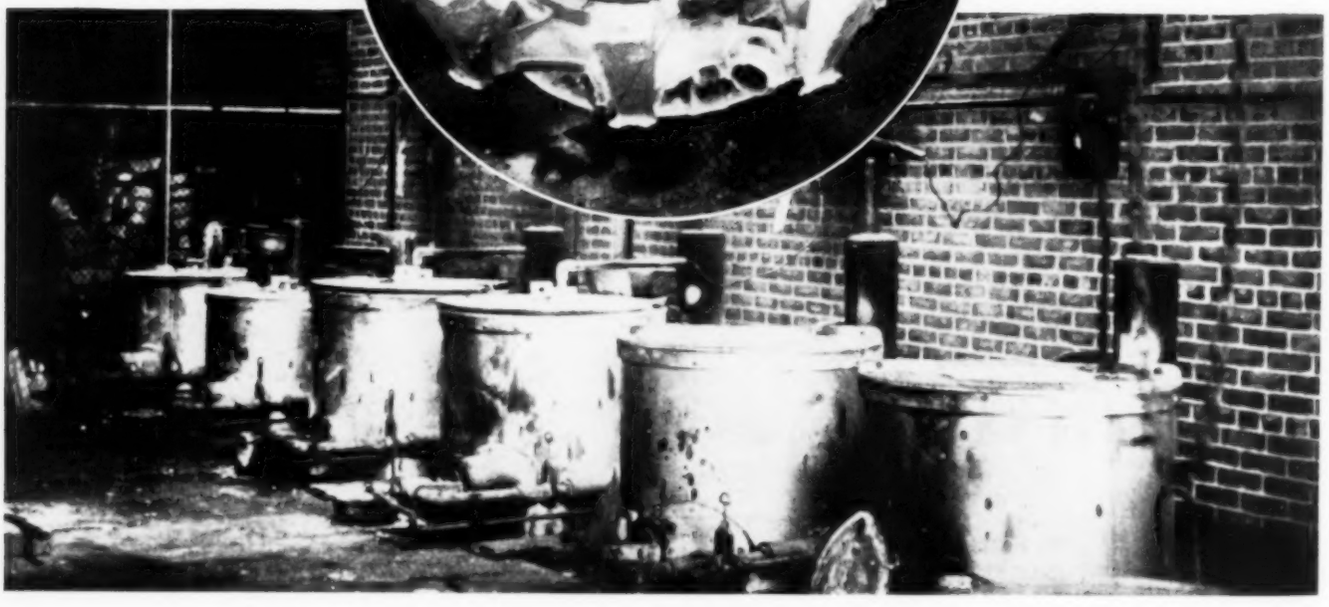

Fig. 9 (Below)—Six oil-fired furnaces accommodating either 100 or 200-pound steel pots are used for melting the magnesium alloys

A·S·T·M· HOLDS ANNUAL MEETING

MANY technical papers and committee reports, presented at the forty-second annual meeting of the American Society for Testing Materials at Chalfonte-Haddon Hall hotel, Atlantic City, N. J., June 26 to 30, featured data of marked interest to the foundry industry. Concurrent with the annual meeting, the society conducted its fifth exhibit of testing apparatus and related equipment. Forty exhibits were sponsored by equipment companies, commercial research laboratories and universities, and A.S.T.M. committees.

Tribute to American metallurgists for their development of ferrous and other metal alloys, which have played so important a part in production of petroleum, was paid by T. G. Delbridge, president of the society, in opening the forty-second annual meeting. Mr. Delbridge, manager, research and development, Atlantic Refining Co., Philadelphia, devoted his presidential address to some "Glimpses at Petroleum", and in an interesting presentation reviewed the growth of the industry since the first wells were drilled in Pennsylvania 80 years ago. He pointed with pride to A.S.T.M. contributions to this industry, both directly and indirectly.

A review of progress through work of the many committees, introduction of new officers, and recognition of two individuals and two companies holding memberships in the society for 40 years, were other features of the opening session. Individuals recognized with certificates for four-decade affiliations were: W. H. Broadhurst, chemist, bureau of highways, Brooklyn, N. Y.; and Frank G. Kennedy Jr., president, Logan Iron & Steel Co., Philadelphia. Companies cited for the same tenure of membership were: Robert W. Hunt Co., Chicago; and Lowe Bros Co., Dayton, O. H. H. Morgan, manager, rail and track fastenings department, Robert W. Hunt Co., Chicago, was introduced as the new president to succeed Mr. Delbridge. During the past year, Mr. Morgan has served as vice presi- (*Please turn to page* 61)

Above—Left to Right: H. H. Morgan, new President; H. F. Moore, Marburg Lecturer, R. W. Carlson, Dudley Medalist; T. G. Delbridge, retiring President, and C. L. Warwick, Secretary-Treasurer

Left—Scientific equipment of various kinds were exhibited by a number of manufacturers

W. B. Lake
President, I.B.F.

I.B.F. ACTS AS HOST TO International

J. Hepworth
Past President, I.B.F.

By VINCENT DELPORT
European Manager
The Foundry

JUNE 1939 will remain in the annals of the Institute of British Foundrymen as an outstanding date—that of the Seventh International Foundry congress, which was held in London from June 12 to 17 under the presidency of W. B. Lake, governing director, Lake & Elliot, Ltd., Braintree, Essex. For the first time in the history of the institute, full government recognition and participation were given to the Congress, the success of which surpassed all expectations.

Delegates from Many Countries

The invitation to hold the international foundry congress for 1939 in Great Britain was extended at the Brussels congress in 1935 by J. E. Hurst, then president of the British institute. Well over 600 delegates attended the congress, of which over 200 had come from about 20 countries. The strongest delegation came from France, with 54 delegates headed by J. Lobstein, president of the Association Technique de Fonderie, Prof. Albert Portevin, and A. Brizon, past-president of the French association. The American Foundrymen's association was officially represented by Dr. H. A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland, and by A.F.A. past-president W. R. Bean, Whiting Corp., Harvey, Ill. G. W. Cannon, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., and his two sons; C. R. Austin, Pennsylvania State college, State College, Pa., and Mr. and Mrs. Thalman also attended from the United States.

There were 27 foundrymen from Germany, 21 from Hungary, 17 from Belgium, 16 from Poland, 15 from Italy, 12 from Norway, 9 from Denmark, 9 from Holland, 7 from Sweden, 4 from Australia, 4 from South Africa, 2 from Czechia, 2 from India, 2 from Switzerland, 1 from Luxemburg.

Delegates from the continent of Europe and from overseas began to arrive on Saturday, June 10, and up to the last minute before the formal opening of the congress on the Tuesday morning, more arrivals were registered.

Visitors Enjoyed Garden Party

Preceding the congress week, on Sunday, June 11, Barrington Hooper, managing director, Industrial Newspapers, Ltd., president of the London branch of the I.B.F., and Mrs. Barrington Hooper, gave a garden party at their home in Harrow, near London, at which all members of the congress who had already arrived were present. This was a most appropriate gesture, which gave members an opportunity to acquaint themselves with each other in an atmosphere of pleasant informality, among the surroundings of an English garden at its best.

Monday, June 12, was devoted to registration of

Foundry Congress

members and to the formal business of the institute. Committee and council meetings were held during the day at the Dorchester hotel, Park Lane, London, the headquarters of the congress, and the annual general meeting of the institute took place in the late afternoon. The report of the council showed that the membership of the institute had reached a new record with 2307 members as at April 30, 1939.

At the election of officers for the year 1939-40, W. B. Lake was duly elected president. Major R. Miles, Teesdale Ironworks, Thornaby-on-Tees, was elected senior vice-president, and D. H. Wood, managing director, Constructional Engineering Co., Ltd., Birmingham, was elected junior vice-president. Tom

Top row—Past President W. R. Bean, American Foundrymen's association and A. Brizon, past president, Association Technique de Fonderie de France. Center—D. H. Wood, junior vice president elect, I. B. F. Right—Madame A. Portevin and Prof. A. Portevin of France, and Prof. Dr. Mont. Fr. Pisek of Czechia. Second row, left to right—Mrs. N. Cook, Mrs. R. Stubbs, Mrs. V. Delport, Mrs. C. H. Bigg, and Mrs. V. Stobie. J. H. Cooper of Darlington, R. Theret of Ardennes, France, and Barrington Hooper, president, London branch, I. B. F. at the latter's garden party. Third row, left to right—Victor Stobie, past president, I. B. F., and Dr. Guido Vanzetti, president, International Committee of Foundry Technical Associations. J. Lobstein, president, Association Technique de Fonderie de France, and C. C. Booth, immediate past president, London branch, I. B. F. Bottom—Mrs. W. B. Lake, President W. B. Lake, Signora Vanzetti and Dr. Guido Vanzetti receiving guests at the banquet

Makemson was re-appointed secretary of the institute.

The official opening of the congress took place Tuesday morning, June 13, at the Dorchester hotel. J. Hepworth, retiring president, was in the chair and was supported by Dr. Guido Vanzetti, of Italy, president of the International Committee of Foundry Technical associations, W. B. Lake, the vice-presidents, past-presidents and other prominent members of the institute, to receive the Lord Mayor of London, Sir Frank Bowater, who had accepted to preside over the opening meeting.

Science and Research Needed

In his address of welcome, the Lord Mayor referred to the International Foundry congress as devoted to the promotion of scientific development and to the improvement of the technique of the foundry industry. He expressed the thought that in these days of intensive work in all that has to do with the foundryman's craft, the congress shoulders responsibilities as never before. He also expressed the belief that in certain directions and branches of the craft, even today, with every modern scientific invention and with the great knowledge of the chemist, we are still unable to excel the craftsmanship of the ancients. Referring to his past business life, he paid tribute to the work of the founders, more especially to the type founder, for his own achievements, and said that he was, therefore, particularly happy to be associated with the gathering and to declare the congress open.

Dr. Guido Vanzetti, president of the International committee, expressed thanks on behalf of all members from overseas for the warm hospitality extended by the great city of London through its Lord Mayor. He then emphasized the need of scientific knowledge and experience, without which the industries of progressive nations cannot reach sure and practical results. He said that a research and test laboratory is a necessity to a modern industrial works, but that, at the same time, scientists must aim at effecting the (*Please turn to page* 69)

Top—Dorchester hotel was headquarters of the congress. Middle—Group at Mr. Barrington Hooper's garden party. Left—Barrington Hooper, W. B. Lake, and Mrs. Delport at Windsor, photos courtesy Dr. A. B. Everest, Mond Nickel Co.

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Senior Vice President

MANY NONFERROUS ALLOYS AVAILABLE

By N. K. B. PATCH

DATA regarding a series of alloys commonly used in the trade, with tables listing physical properties, and a short description of the specifications by which they are covered have been published in the past several issues of THE FOUNDRY. In a few instances, an outline has been given on the use of a particular alloy in the commercial trade. However, data regarding the practical application of these alloys are somewhat meager since the list covers a large number of different compositions and the exact application of each is not always clear.

It will be noted that the alloys listed comprise a series of different types and that these are subdivided into a number of specific compositions. The types embrace red brasses, bearing bronzes, valve bronzes and brasses, alloys known as manganese bronze, which are really yellow brasses, plus iron, aluminum and manganese, phosphor bronzes for bearings, gears, etc. and aluminum bronze. Each of the different types has its general applications based on physical properties developed under commercial working conditions.

Variations Influence Physical Properties

Variation in proportions of several elements comprised in each of the different types of alloys influences physical characteristics along certain lines, as do also presence of small amounts of other elements not definitely specified or demanded and only occasionally found present. Some of these additions are added deliberately for refinement, as for example, nickel in fractional percentages, or even in marked quantities. Effect of some impurities even now are being studied carefully by experts and during the past 6 months, accurate data have appeared on the effect of aluminum or antimony, or both, upon the red brasses known as ounce metal or 85-5-5-5.

The investigation was made by H. B. Gardner and C. M. Seager Jr. at the bureau of standards, Washington, under the sponsorship of the Nonferrous Ingot Metal institute. The paper was presented at the recent meeting of the A.F.A. in Cincinnati, and is the most authentic and exact compilation of facts now available regarding influence of those two elements on that red brass alloy. The authors are to be congratulated on the fine work they have done and we hasten to correct the information published in the January installment, in which it was mentioned that antimony was likely to cause some trouble in this alloy if in excess of 0.15 per cent.

Evidence appearing in the valuable contribution by Gardner and Saeger indicates that antimony apparently does not cause much trouble and the limitation of the A.S.T.M. of not to exceed 0.25 per cent is a reasonable limitation of that element as an impurity. The research work also proves the desirability of limiting aluminum to the low figure specified by the A.S.T.M. of 0.005 per cent.

Effect Varies with Composition

It should be remembered that the effect of impurities on the different compositions may not be harmful when those compositions are under one type of service, but under other types of service their effect may be harmful. The form in which the impurity appears is quite as important as the amount of it, in judging its effect under different circumstances. For example, if a composition is to be used as a bearing alloy and the impurity tends to form an extremely hard abrasive crystal, it would give trouble in bearings where the mating journal was insufficiently hard to resist that abrasion by the hard crystal. If that same composition were being used for a valve or fitting subject to hydrostatic pressure, it might give no trouble from the standpoint of leakage or any other way be a harmful addition to the composition for that particular service.

It is interesting to compare (*Please turn to page* 76)

Renaissance OF THE

By FREDERICK A. MELMOTH
Vice President
Detroit Steel Casting Co.
Detroit

THERE being no directional weakness due to work distortion in a steel casting, it should be apparent that, correctly made and heat treated, it offers a service performance equal to most worked materials, and in some applications better than many.

Heat treatment has been dwelt upon considerably, owing to the profound conviction of the author that, as an industry, steel founders have neglected to publicize sufficiently the ready and complete response of their materials to refinement by the thermal means, leaving an impression that mechanical work is a necessity to the obtaining of excellent physical properties in steel. Such is definitely not the case, and designers should be so informed on every possible opportunity. One still encounters engineers who fear brittleness, "because it is only a casting." Yet, when confronted with cold bend tests, completely doubled and associated with tensiles up to 130,000 pounds per square inch, such skeptics are fairly easy to convince. The real trouble is that engineers have no one to inform them of such possibilities but the steel founding industry, and as a whole we have failed to do so effectively. A bibliography of American literature on heat treatment of steel castings is presented on page 86.

Sand Control Is Important

Earlier in the article it was pointed out that in approaching metallurgical problems associated with steel castings, it was inevitable that the metallurgist would be led into the investigation of materials and methods used in molding. It is presumed that the demands for better surface finish and internal soundness experienced in America has been also experienced in other countries, and this has led to intensified work on sands and other materials used in the making of molds. This work has become largely the responsibility of the plant metallurgist, and few, if any, foundries in the United States are without a section of their laboratory devoted to sand control, and to some extent, also, investigation of sand properties from the standpoint of sounder and better-surfaced castings.

It is not proposed to discuss any shortcomings of existing sand testing and control methods, or to attempt to compare differing methods. From the essentially practical viewpoint, it would appear to be accepted that the instruments and methods available give results directly comparable in regular conditions and with the same method of operation. This has enabled executives to formulate control schemes using such instruments as guides and indicators and achieving the practical results of preventing large variations capable of affecting the product.

Use Synthetic Sand Mixtures

Though a few steel foundries still use a naturally bonded sand, the great majority rely entirely upon synthetic mixtures, and it is the accepted opinion that such mixtures lend themselves more readily to definite quantitative control. From the realization that permeability to rapidly evolved gases is essential in both facing and backing, there has developed an almost general use of sand handling and reclaiming equipment. Generally speaking, there is no attempt to remove all fines, it being realized that regularity of fines content, at a reasonably low figure, is far more logical and practical.

It is, of course, probable that some part of the improvement in the soundness of steel castings has resulted from improved steelmaking practice, but it is believed generally that by far the greater part of such improvement has occurred as the result of regularized sand conditions and an appreciation of the significance of mold pressures during pouring.

The preponderance of green sand methods of mold production in the United States has much intensified work along these lines, and it is typical to find all sand, both facing and backing, for the lighter types of castings subject to careful preparation. Commonly, such sand arrives at the mold with known permeability, green and dry strength and moisture content. The backing sand, where facing sand is used, is regularly higher in permeability and lower in bond than is the facing, thus tending always to automatic venting, and

In this and the July issue, The Foundry has published the annual exchange paper of the American Foundrymen's association to the Institute of British Foundrymen. The paper was presented at the International Foundry congress held in London, June 12 to 17.

E STEEL CASTING

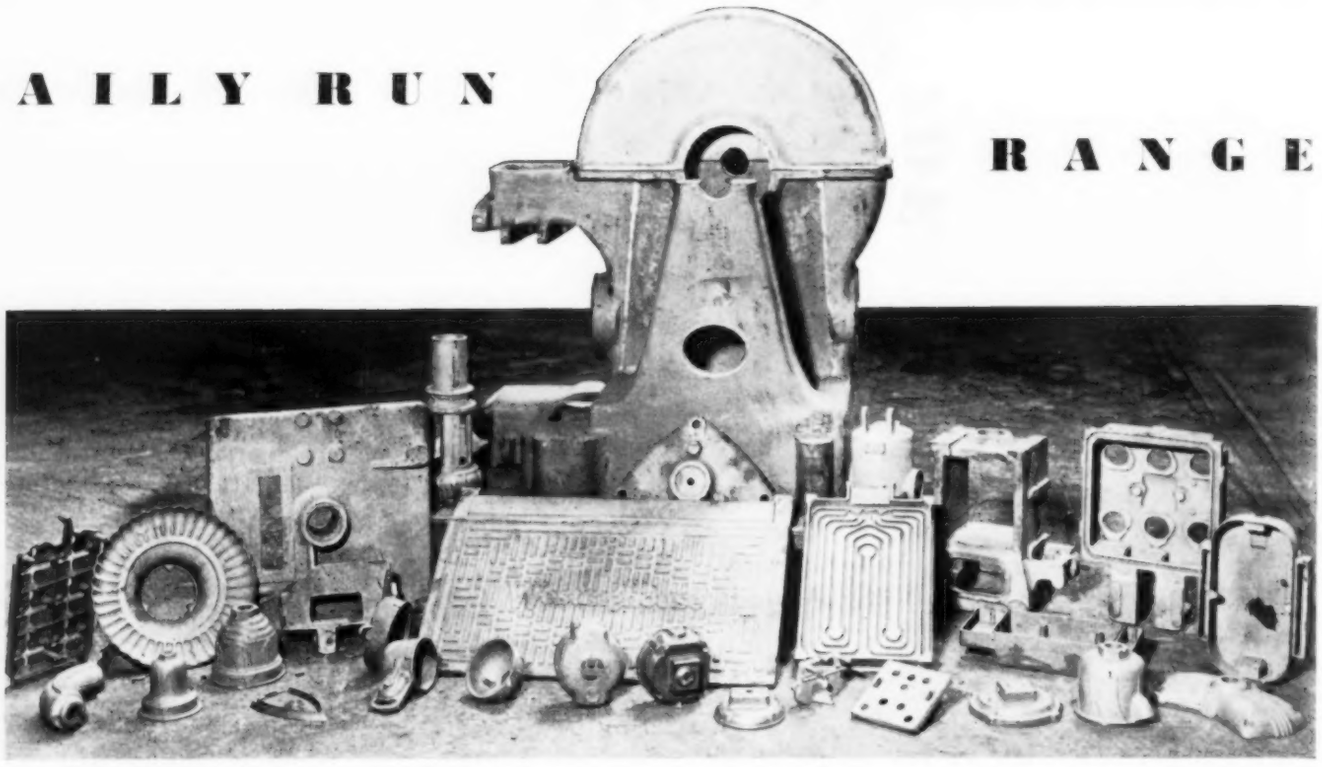
the prevention of trouble due to the building up of gaseous pressures in the body of the mold during the pouring operation. This method of thought has rendered possible the use of finer grain materials for facing purposes, contributing considerably to the excellent surface finish of American light steel castings, without any increased risk of porosity.

It is almost axiomatic that it is unwise to prophesy, but indications most distinctly are that the steel foundry of the future will deliver all sand to the molding floors fully prepared to known and understood standards, and not merely the facing sand as in many foundries is the case today. The many ill effects upon the solidifying casting which are traceable to variations and deficiencies in backing sand render this quite necessary and logical if control and resulting regularity of product are to be achieved.

It should here be noted that cement bonded sands are creating an increasing amount of interest in the United States, and some foundries are operating the Randupson process under license. The details of the process are known and need not be described, it being sufficient to say that reports from users of it indicate a considerable improvement when the working details are correctly mastered and understood.

In commenting upon molding methods commonly in use in America, the author would like to attempt to remove several misconceptions which appear to be commonly held by many of his European friends. The first is the idea that repetition production, or mass production as it is more often called, is common in the steel founding industry. It is true that with certain specialized types of work, such as railway car parts, the demand, periodic in oc- (*Please turn to page* 80)

DAILY RUN RANGE



By F. J. FREDRIKSEN
Westinghouse Electric & Mfg. Co.
Cleveland

THE Cleveland foundry of the Westinghouse Electric & Mfg. Co., a feeder division for nine Westinghouse plants in various parts of the country, is confronted daily with the problem of meeting the particular requirements of these plants, and of delivering castings suitable for their specific products.

A day's run may range from readily machineable castings, which will cause no difficulties in automatic machine shop setups, to castings of a heavier type, with definite specifications as to physical properties. These problems are met daily by rigid control of foundry operations, and rigid control of the raw materials used. An indication of the range of castings handled in one day is shown in Fig. 1.

Castings with definite physical requirements are poured at the beginning of the heat. A pearlitic iron is alloyed to suit the cross-section of the castings. Types and sizes of these castings are many, and careful control of strengthening, hardening, or graphitizing agents added to the iron at the spout is required.

Sheave castings with sections varying from ¾-inch to 3 inches on machined sections, with 40,000 pounds per square inch tensile strength and 40 scleroscope hardness requirement at the bottom of the machined cable grooves, are not uncommon. However, interest can be centered in the fact that this variation in metal thickness is in the same casting, and machining is applied to the thin section as well as to the heavy section. Chills often are used to advantage in producing that type of casting.

Physical requirements are met by the addition of alloys at the spout where the molten metal receives the addition before reaching the mixing ladle. This insures a uniformity of mixture by the time the metal runs into the crane ladle. Chill test samples, taken from each ladle of iron, give a definite control of hardness. First tap metal is not used regardless of type of casting to be poured.

Most of the sheave castings at Cleveland are made in dry sand molds. Special care is given to venting on the rim and hub of the castings to insure free exit of gases. The casting is gated on the hub, and fed from a runner box. No heads are used for feeding. One of the larger sheave castings is shown in the center of Fig. 3.

A specially prepared cope and drag facing is used on molds for bases of flat irons. Tests are made daily for permeability, moisture content, and green strength of the sand.

As all castings are checked for thickness, pouring practice and weight are factors considered in the production of this piece. Standard height ladle hooks allow the molds to be poured from a uniform height. With this setup, excessive straining of the mold is avoided. Special lipped ladles are used to insure the (*Please turn to page* 88)

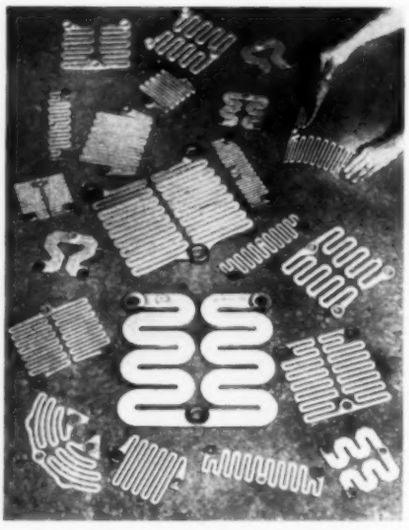


Fig. 1 (Above)—Range of castings handled in one day may be gathered from this view. Fig. 2 (Left)—Flexibility of resistance grids shown at upper right

ASSEMBLE MOLD FOR GRINDER BED

THE accompanying illustrations show several steps in the Randupson process of molding an 18-ton roll grinder bed in the foundry of the Farrel-Birmingham Co., Inc., Ansonia, Conn. A set of coreboxes as shown in Fig. 4 take the place of the usual pattern. This constitutes one of the economical features claimed for the process since a single comparatively small corebox may be used to produce any desired number of cores. For example the 28 cores required to form the two side walls of the mold were made in one box. In the same manner duplicate cores were made and assembled to form the bottom and top of the mold.

In this process the material in the mold, whether rammed directly against a pattern, or formed into blocks as shown in the illustration, is a silica sand bonded with cement. Extended and detailed description of materials and method of application appeared in the Dec. 1935, Jan., Feb., March 1936, and Nov. 1937 issues of THE FOUNDRY.

The sand contains approximately 6 per cent moisture and is rammed in the coreboxes in the usual manner either by hand or on a jolt machine. With the exception of the hooks by which the dried cores are handled, little reinforcement in the shape of rods or arbors, is required, The cores are turned out on plates and allowed to air dry for periods ranging from 24 to 72 hours, depending on shape and size.

In the accompanying illustration Fig. 4 shows the group of coreboxes. Fig. 2 shows the mold partly assembled in a pit in the floor. Fig. 1 shows all cores in place with the exception of the covering cores. The pit also has been filled with sand rammed around the side and end walls. Fig. 3 shows the roll grinder which was cast of meehanite, ready for machining. The bed was molded and cast in the opposite position to that in which it will function in service and the metal entered the mold simultaneously from gates at both ends.

One of the principal advantages claimed for the process is that the individual blocks or cores do not swell, shrink, sag or become distorted in any manner during the drying period. When they are assembled they fit together closely without rubbing or filing. The straight, solid, substantial mold produces a casting true to shape and dimensions.

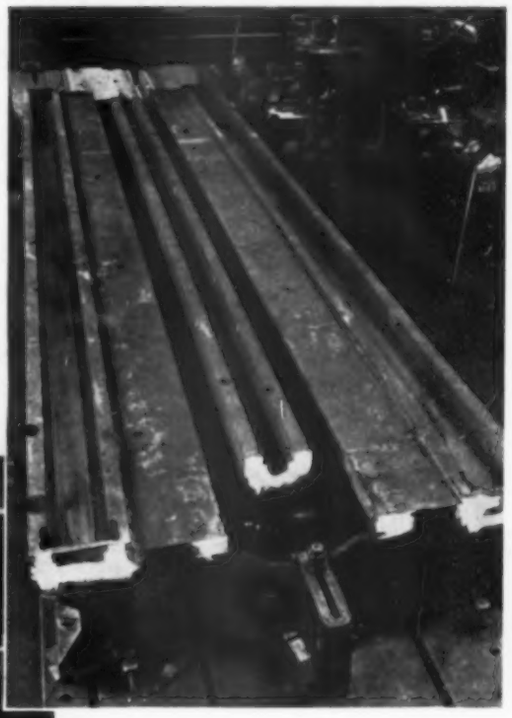


Fig. 1 (Lower Left) Mold with cores in place. Fig. 2 (Left) Mold partly closed. Fig. 3 (Above) Roll grinder casting. Fig. 4 (Below) Coreboxes

QUESTIONS AND ANSWERS

Make Municipal Castings from Scrap Mixture

We shall appreciate your opinion on the advisability of making municipal castings from a cupola mixture of half and half stove plate scrap and good miscellaneous scrap. Casting thickness is approximately ¾-inch.

Since none of the castings is to be machined, the proposed iron mixture will serve satisfactorily. In fact the combination might be changed to a 60-40 mixture either way without affecting the resulting casting. We assume that the stove plate scrap is clean and does not contain any appreciable amount of burned grates or fire pots. The iron will be a little more sluggish than where pig iron is incorporated in the charge, but if melted properly and at a high enough temperature it will run a reasonable distance in any mold. No particular technique is required in charging the material into the cupola, except that where large pieces of scrap are present it is advisable to charge them first.

Nickel Silver Castings Have Small Holes Under Skin

We made some nickel silver castings 20 inches long, 7 inches wide and 1 inch thick which looked fairly good on the surface, but inside they would machine flaky, and were full of very small holes. We have had the same trouble with bar stock and bushings. We mix our own metal from used nickel which we purchase and which is supposed to be pure. We melt the metal at 2400 to 2500 degrees Fahr. and use glass for flux. We put in one ounce of magnesium for fluxing and 2 ounces of copper phosphate. We pour the metal fast, and in molding we have used large gates and risers. We use a 75 grain sand with 22 per cent clay content. Then we put in about one-third Albany sand so as to cut the clay content down, and make the permeability a little lower than the sand had been. Sometimes we use steel facing also.

While you do not give sufficient information upon which to base a definite opinion, the thought occurs that your difficulty is due essentially to poor melting practice. Nickel silver similar to other nonferrous alloy has an avid affinity for gases of combustion, and consequently the metal should be melted as hot and as rapidly as possible. The metal should not be permitted to remain in the furnace for any length of time after it has reached the required temperature. Ordinarily a 150-pound charge should be melted in 1¼ hours in an oil-fired furnace. With coke or coal from 2 to 3 hours will be required and consequently there is greater opportunity for gas absorption.

We noticed that you mention the use of copper phosphate for a flux, but presumably you mean phosphor-copper. The best procedure for deoxidizing and degasifying nickel silver, based on 100 pounds of metal, is to add 1½ ounces of pure manganese 5 to 7 minutes before pouring; then follow with ¾-ounce of metallic magnesium, 3 to 5 minutes before pouring, and then just before pouring add 2 ounces of phosphor-copper.

If the metal is melted at 2400 to 2500 degrees Fahr. the temperatures are about 75 to 100 degrees too low since the average castings in nickel silver should be poured at a temperature of 2400 to 2450 degrees Fahr. While you state that you are using large gates and risers, we wonder if the connection to the casting or casting cavity also is large. Large risers and sprues will not be of much benefit if the point of attachment to the casting is made small since that portion will freeze long before the casting, riser or sprue.

Sand for nickel silver should be on the dry side containing not more than 5.5 per cent moisture. The clay content should be around 15 to 18 per cent and the grain size may range from 60 to 90.

Desires To Make Heel Plate Castings in Malleable

I shall appreciate any information you may have on the subject of casting malleable iron heel plates. I have been told that most of these castings are made in England. Can you refer me to any book or pamphlet on the subject?

We are not aware that there is anything odd or special about the manufacture of heel plates. We assume you refer to the small flat castings that are placed as reinforcement on the heels and in some in-

stances on the soles of shoes. They are equipped on one side with a number of small, sharp prongs that are driven into the leather. In the foundry the patterns are mounted on a matchplate and the molds are made on a squeezer machine or on the bench. If you are inquiring about the metal and the melting practice, you are wading into deep water. Some malleable iron is melted in the cupola, but the great bulk—at least in this country—is melted in the air furnace.

The furnaces range in capacity from 5 to 40 tons, which of course means that that even where heel plates are made they constitute only a small part of the heat. All malleable castings pass through a second stage. After they are cleaned they must be annealed. The entire procedure is long and expensive and is feasible only where large quantities are handled. If you are contemplating handling the heel plate castings we think the logical and simplest solution of the problem is to have them cast at some local malleable iron foundry.

Soldering Aluminum Alloys Requires Some Skill

We would like to know the method and materials used in the tin-zinc process whereby a section of an aluminum matchplate pattern may be built up using ordinary soldering iron for the application of the tin-zinc.

We are not quite clear as to what you mean by the tin-zinc process. Of course, we know that soldering aluminum is troublesome, but it frequently is done with a solder made up of tin, lead and sometimes some zinc. This we presume is what you refer to. The trouble with soldering aluminum and its alloys is that, when the surface is apparently clean and ready for soldering, in reality it is covered with a thin film of aluminum oxide and no matter how fast you clean it, this film is renewed by the presence of the oxygen in the air and, therefore, retards the tinning process that is essential to a good soldering job.

The best soldering with aluminum is done by cleaning thoroughly the surface so that there is no grease or dirt on it and then covering the surface to be soldered with fluid solder, scratching the surface through the molten solder with a wire brush. This cleans the surface while it is covered with the fluid solder and permits the solder to attach itself without the air being able to reach the aluminum.

A thoroughly well tinned surface thus may be provided to which the solder will attach itself and this solder may be built up from there as far as desired in the usual way. If the matchplate is made of an aluminum alloy containing much zinc, it also will be desirable to use first a soldering flux in cleaning the alloy as well as the molten solder and wire brush process described above. The important factor is to make a thoroughly clean job under the solder to which the solder may attach itself and do so while the molten solder insulates the surface from oxidation by the air.

Wants To Use Forehearth for Mixing Iron from Cupola

We melt from 15 to 20 tons of iron daily in a cupola lined to 42 inches with tuyeres 15 inches above the sand bottom. The 1000-pound charges are made up of pig iron 350 pounds, return scrap 350 pounds, other scrap 250 pounds and steel scrap 50 pounds. Most of our castings are thin, requiring soft, hot iron, but we find a variation of 30 points in the silicon content. When we use steel up to 7.5 per cent some of the castings are unmachinable. We have tried holding the metal in the cupola as long as possible and we also have tried tapping the metal into a 500-pound bull ladle. Holding the metal in the cupola does not seem to produce a uniform composition. Metal from the bull ladle transferred to hand ladles is not hot enough to pour the light castings. Would a forehearth solve our problem?

You do not give any data on the amount of coke or the volume of air, but from your statement that the metal transferred from a mixing ladle to a hand ladle is too cold to pour thin castings, we are inclined to the opinion that a slightly increased temperature in the cupola would solve your problem. Steel in the charge lowers the temperature and the silicon content. Therefore, to secure the same running qualities, a mixture with steel must be melted at a higher temperature than a straight gray iron. This increase in temperature can be secured either by reducing your iron charge to, say, 800 pounds, or, by increasing your coke 40 or 50 pounds.

You may have to adjust the blast a little. A 500-pound ladle is too small for a 42-inch cupola. The well of your cupola has a capacity for about 3000 pounds of iron. If the metal is held in the cupola until the well is nearly filled and then tapped into a 1000-pound ladle, you should have no difficulty in producing a uniform mixture. Undoubtedly a forehearth is a satisfactory mixing medium, but it entails a certain amount of extra work and up to the present has not been adopted to any large extent in American foundries. A complete description covering construction, upkeep, operation and other related features is presented in "Melting Iron in the Cupola" by Hurst.

Briefly it simply is a steel, brick lined chamber mounted in front of and adjoining the cupola. Molten metal from the cupola runs through the open breast—not through a tap hole—into the forehearth. The forehearth is provided with a tap hole and spout and the metal is tapped as in ordinary cupola practice. Best results are secured by maintaining a fairly constant volume of metal in the bath. The brick lined bottom of the forehearth is several inches below the level of the sand bottom in the cupola and is sloped gently toward the tap hole so that the metal will run readily through the tap hole, and also so that the forehearth may be completely drained at the end of the heat. In the usual type, the bottom is stationary and the cover is removable to permit repairs to the bottom and side wall. In your case a shell the same diameter as that of the cupola, about 30 inches high and lined with regular fire brick on edge will serve satisfactorily. The lid or cover is a frame into which the bricks are built to form a low arch.

Gating Method Is Not Major Factor

Our average bronze bushing 12 inches in length, 2½ inches diameter outside and 1¼ inches diameter inside is made from a mixture containing copper 79 per cent, lead 15 per cent, tin 5 per cent and nickel 1 per cent. Phosphor copper is used as a deoxidizer. The metal is melted in a 200-pound pot in a coke fired pit furnace. We gage the temperature with a pyrometer and have poured the castings horizontally and vertically at various temperatures ranging from 1800 to 2200 degrees Fahr. We have tried various types of gates but the castings show gas holes and lead sweat.

Method of gating these castings is not a factor of major importance. They may be molded and cast horizontally, vertically or on an incline. They may be gated on top, at the bottom or on the side. Gas holes in the casting indicate that either the melting practice or the molding practice is at fault. With such a high percentage of copper, the metal readily absorbs gas. Therefore, the metal in the pot should be protected with a covering of charcoal, broken glass or some other form of fluxing agent that will form a seal. With the metal properly protected the next place to look for the cause of gas holes is the mold or the core.

Usually the core is responsible. The gas does not escape readily through the end prints. Some of the gas enters the metal and remains there. The obvious remedy is to provide a core through which the gas can escape readily through the proper channel. For example your present 1¼-inch core should be composed almost entirely of sharp sand, bonded with a minimum amount of oil or other binder, dried thoroughly and provided with a ¼-inch diameter vent hole through the center. The mold sometimes is to blame. The sand is too wet or rammed too hard and the metal does not lie quietly in the mold. Where two or more bushings are rammed in the same mold, the sand body between them should be vented on account of the extra amount of steam generated. Lead sweat usually can be prevented by stirring the metal vigorously in the crucible before pouring each mold.

Will Build Small Iron Foundry

We are planning the erection and operation of a small gray iron foundry in a South American country. Anticipated output will be approximately 30 tons per month of small castings, mostly hollow ware and sad irons. Is it practical, efficient and economical to melt the iron with crude oil? Does the volume of work justify the installation of molding machines or permanent mold?

The questions raised in your inquiry present so many controversial angles that we hesitate to give a dogmatic answer to any of them. Our suggestion would be that since apparently you are not familiar with foundry practice, that you engage the service of a thoroughly competent and practical foundryman. With a knowledge of all the conditions he would be in position to select the proper equipment.

For example, crude oil may be employed as a fuel in melting iron, but you will require a special type of furnace, burners, lining and atomizing equipment. Unless the price of coke is exceedingly high, the cupola will turn out molten iron cheaply, and in addition is operated easily and kept in repair. For a 30-ton monthly output of small castings, you will need to melt about 40 tons, or on a 25-day a month basis approximately 3200 pounds per day.

A cupola about 20 inches inside diameter will melt that amount in about an hour. On light hollow ware castings, half a dozen molders will put up that amount of work and pour it off in a day. Touching on the subject of dies or permanent molds, they are quite satisfactory in foundries where a great many duplicate castings are made and where a supply of molten metal is available throughout the day. Unfortunately this condition does not obtain in your case, where the total output per day is slightly over a ton, where (probably) a great many different patterns are used and where no satisfactory type of melting medium has been developed for producing such a small quantity of metal over such an extended period.

Also the initial expenditure for molds would be so heavy that the saving effected over the hand molding method would extend over such a lengthy period as to defeat its own object. To a lesser extent the same objection applies to the installation of molding machines. To show a profit the machine must be kept in constant operation. If you can arrange the work so that the machine may be employed on one pattern for a considerable period, before changing patterns, then the machine will show a profit.

Shrinkage Shown in Bronze Casting

We are forwarding for your inspection two small bronze castings and the sprue and gates from a larger casting. These castings were poured from the regular 88-10-2 mixture melted under a thick layer of charcoal. The castings, apparently solid and clean, machined up perfectly, but failed under a hydrostatic test of 300 pounds. Accepted castings must stand a pressure of 750 pounds. We have had considerable trouble of this kind recently and although we have tried every precaution with which we are familiar, we have not found a remedy.

Basing an opinion solely on the evidence submitted we are inclined to the view that the trouble merely

Large turnout of members and guests attended the annual outing and picnic held by

is shrinkage, accented to some extent by the pouring temperature. The metal 88-10-2 also known as gun metal and admiralty bronze must be poured within a comparatively narrow temperature range. Discoloration in the porous area of the gate for the large casting is direct evidence of a temperature that is too high.

The holes in the small castings, also at the gate, shows that the metal shrunk to a greater extent than could be supplied by the gate which apparently solidified before the metal in the casting. The obvious remedy is to pour the metal at a lower temperature and to provide risers on the casting that will deliver metal and thus compensate for the shrinkage. Size, shape and position of the risers are determined by local conditions. The only really important feature is that they must be ample to perform the function for which they are intended.

Has Trouble with Bronze Castings

We are sending two faulty bronze castings and would appreciate your comment. The smaller one is from the end of a standard test bar which failed at very low load. The alloy used is a medium grade manganese bronze produced by adding 4 per cent commercial hardener to 96 per cent clean yellow brass scrap. The other is a broken section from a 13-inch long valve spindle which fractured while being threaded. Apparently the only faulty section of the metal was right at the break as a test bar cut near the break showed high strength both in tensile and torsion, as well as high elongation. This metal is obviously a tin bronze, but of what analysis we are unable to determine as it is from a piece of old stock.

Examination of the piece which you state to be the end of a standard test bar reveals a very coarse, dendritic structure, indicative of extremely slow cooling conditions, and presumably resulting from pouring at too high a temperature. Further examination of the structure under a comparatively low power magnifying glass reveals numerous interstices in the dendrites so that the metal is pierced through with many fine passages, resulting in a quite open, porous condition. This, we believe, is caused by improper feeding of the bar or casting. Examination under the magnifying glass also reveals a number of black particles which evidently are slag carried into the casting because the metal was not skimmed properly.

Therefore, we suggest that you look into the question of pouring temperature, feeding of the casting, and proper skimming. You do not mention how the test bar was made, but presumably it followed the usual practice of being a coupon attached to the casting. Possibly the trouble may arise from the location of the coupon in relation to the casting. It may be that you are using the wrong type of coupon for the size of the casting. In the case of large castings, the coupon is in the form of a bar with a trapezoidal cross-section, and it is approximately 8¼-inches long, 1⅜-inches high, and 1⅛-inches wide, on the longest dimension. In the case of small castings, the coupons are made in the form of two legs on an upper section which acts as a reservoir for feeding them properly. Further details on the bars are presented in A. S. T. M. specifications (B54-27).

The second specimen, part of a valve spindle, shows characteristics similar to those described for the test bar specimen. Consequently, what has been said previously also will apply. In other words, the metal was poured too hot. Further examination of the machined surface reveals numerous fine holes which usually are termed pinholes, and those are the result of gassing the metal in the furnace. Manganese bronze must be melted carefully under controlled furnace conditions.

Facing Mixture for Steel Molding

Can you give information on a sand mixture for a steel foundry where castings are made in green and dry sand.

Local conditions, to a great extent, determine the most suitable sand mixture to employ. Sand deposits vary in character in different parts of the country and the freight rate usually is the deciding factor in the final selection. Satisfactory mixtures may be prepared from various mixtures of silica sand and clay. The most satisfactory for any given locality or for any given molding process can be found only through a series of experiments. Synthetic sand is employed in the great majority of American steel foundries.

The base of the mixture is a silica sand containing from 94 to 99 per cent silica. The new sand is mixed with old sand in varying proportions from 25 to 75 per cent depending on character of the work and cost of the new sand. Clay or bentonite in a finely pulverized condition is used almost universally for imparting cohesiveness to the mixture. Suitable bond has a melting point at least up to 1500 degrees Cent. Small quantities of a farinaceous product made from corn or wheat usually is added to the mixture. This addition helps to impart a smooth skin to the castings.

The sand mixture is wet down with molasses water or with water containing a small amount of a substitute for molasses. This material is a byproduct of the wood pulp industry and is marketed under various trade names. Its bonding strength is about one and one half times that of molasses when used on silica sand. Practically the same material is used for facing molds and cores whether green or dried. In the green sand facing the bonding material is held to a minimum amount and the sand itself is worked much dryer than it is in a mold where the sand later is dried.

picnic held by the Quad City chapter. Photograph by F. S. Reading, Rock Island, Ill.

MEN of INDUSTRY

FRANK S. O'NEIL recently was appointed general manager of the Indianapolis plants of the Link-Belt Co. Mr. O'Neil has been assistant general manager for the past several years. He joined the Link-Belt organization 32 years ago at the company's Chicago plant, where he worked 10 years in the foundry, machine shop, cost department and rate setting and production department. In 1916 he was transferred to Indianapolis and has served there successively as assistant superintendent in charge of malleable iron chain assembly, superintendent of the Ewart plant, and assistant general manager of both Ewart and Dodge plants.

♦ ♦ ♦

JOHN L. LOWE, recently has been made foundry manager, Vilter Mfg. Co., Milwaukee. Mr. Lowe received his bachelor of science degree in mechanical engineering, majoring in industrial metallurgy, from Michigan State college, East Lansing, Mich., in June, 1933, and his professional degree in mechanical engineering from the same college in June, 1938. While attending college he worked for the Saginaw Malleable Iron Co., Saginaw, Mich. He then became connected with the Campbell, Wyant & Cannon Foundry Co., Muskegon Heights, Mich., working through several departments to the position of production metallurgist and melting superintendent. When the Centrifugal Fusing Co., Lansing, Mich., a subsidiary of Campbell, Wyant & Cannon was built and placed in operation, Mr. Lowe was transferred to the new plant as melting superintendent and metallurgist. He is a member of the American Foundrymen's association, Electric Metal Makers guild as well as other technical associations.

♦ ♦ ♦

R. O. FLANSBURG, Belle City Malleable Iron Co., Racine, Wis., recently was awarded first prize in an essay contest for foremen conducted by the National Industrial Conference board, New York. The subject of Mr. Flansburg's essay was, "What Can the Foreman Do To Build High Morale in His Department." Entries in the contest were received from 226 different companies from all sections of the United States, with 39 states represented. The prize essay won an award of $100. Mr. Flansburg has been connected with the Belle City Malleable Iron Co. for 14 years and now is metallurgist in full charge of melting in both the Belle City Malleable Iron Co. and the Racine Steel Casting Co.

♦ ♦ ♦

P. H. LOVELAND has succeeded IRA F. CHENEY as superintendent of the Griffin Wheel Co., Detroit. As noted in the June issue of THE FOUNDRY, Mr. Cheney has been transferred to St. Paul as superintendent of the plant there. Mr. Loveland formerly was connected with the Chicago plant of the Griffin Wheel Co. and has been associated with the firm for 23 years.

♦ ♦ ♦

W. B. LAKE, governing director and founder of the firm Lake & Elliot, Braintree, England, was presented with a silver salver and tankard by the 750 employes, June 23 in celebration of his 70th birthday. The happy occasion was observed in the Institute hall where E. A. Clarke, sales manager and oldest employe made the presentation. On the platform Mr. Lake was accompanied by Mrs. Lake, a son Compton Lake, Frank Elliot, member of the original firm, members of the board of directors and several of the oldest em-

(*Concluded on page* 36)

P. H. Loveland

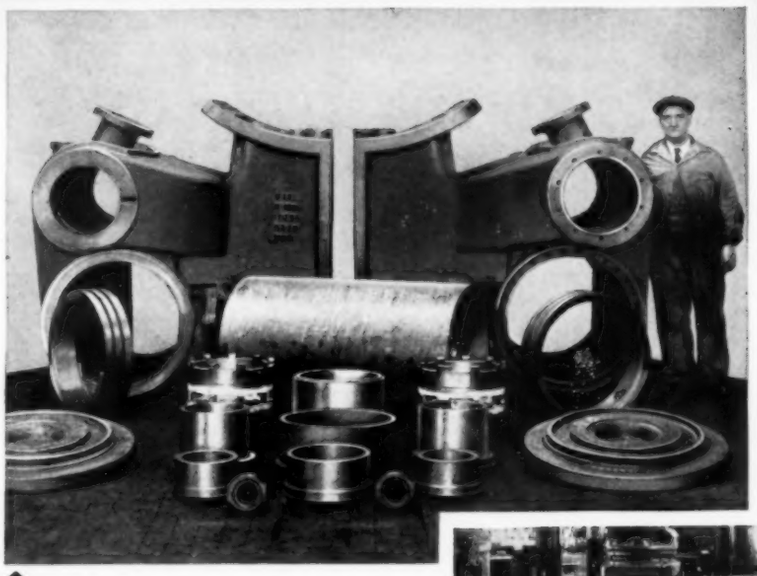
John L. Lowe

Frank S. O'Neil

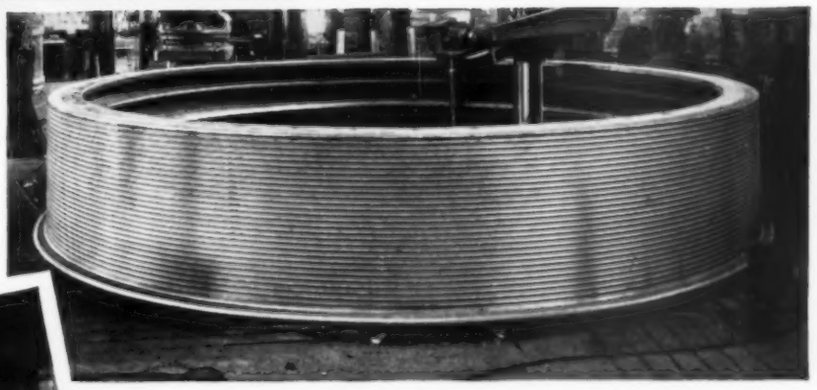
R. O. Flansburg

WHEN COMPLICATED PATTERNS MAKE YOU FRET...

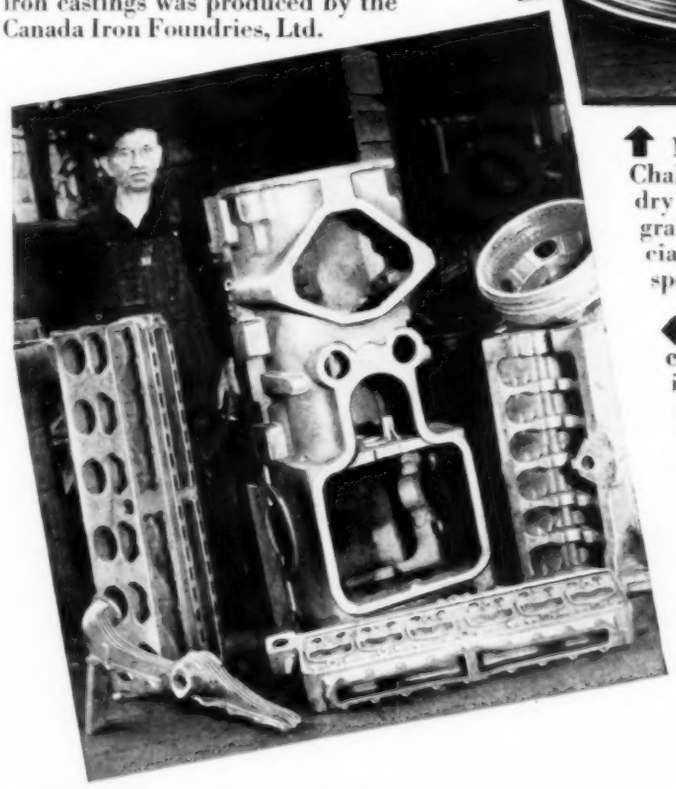
USE NICKEL'S HELP



Strong, pressure-tight wear-resisting alloyed iron locomotive castings retain their strength despite temperature extremes in Canadian National Railway service. Nickel toughens iron, permits almost uniform hardness readings throughout all sections. This 27,000 pound order for Nickel alloyed iron castings was produced by the Canada Iron Foundries, Ltd.



Machining a high-strength iron drum for a 400-ton Allis-Chalmers hoist. As little as 1 to 1½% Nickel makes foundry and shop 100% happier. Nickel cast irons are close-grained, machine easily and smoothly and wear well. Specially heat-treated or chilled Nickel cast irons meet severest specifications of modern engineers.



Every foundryman has tough jobs where shapes, contours, clearances, and engineering requirements seem impossible. Then Nickel helps—preventing chilled corners and edges, increasing strength, reducing machining time, withstanding pressures unapproached by plain irons. Nickel helps avoid rejects. Study these complicated automotive castings made of "Ryanite", a Nickel chromium cast iron alloy produced by Allyn-Ryan Foundry Company, Cleveland.

HELP—WHEN YOU NEED IT

In 24 American and Canadian cities, suppliers of International Nickel products offer practical advice from trained foundry men. Or you may wire or airmail any questions direct to the Inco Engineering Department, 67 Wall Street, New York.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Concluded from page* 34)

ployes. The meeting was presided over by director J. B. Whitfield. Mr. Lake, this year is president of the Institute of British Foundrymen and was particularly active in making the recent international foundry congress in London a pronounced success.

♦ ♦ ♦

J. McAFEE, metallurgist, John McIlwraith & Co., Ltd., Melbourne, Australia, recently visited foundries in various sections of the United States.

♦ ♦ ♦

EMMETT J. FALLON, formerly connected with the Des Moines Foundry & Machine Co. and Grinell Washing Machine Co., has been elected president and a director of the Pettibone Mulliken Corp., Chicago.

♦ ♦ ♦

E. SPENCE BOWMAN, managing director, the British Mining Supply Co., Ltd., Johannesburg, South Africa, has been visiting foundries and equipment and supply manufacturers in the United States.

♦ ♦ ♦

DR. HARRY A. SCHWARTZ, manager of research, National Malleable & Steel Castings Co., Cleveland, recently was elected an alumni representative on the board of managers of his alma mater, Rose Polytechnic institute, Terre Haute, Ind.

♦ ♦ ♦

RUSSELL M. TREE, formerly works manager, was elected vice president in charge of manufacturing of the Mueller Brass Co., Port Huron, Mich., recently. D. E. LINDQUIST, formerly plant superintendent, was elected vice president in charge of engineering, and P. E. PARKIN, assistant superintendent, was appointed to succeed Mr. Lindquist as plant superintendent.

♦ ♦ ♦

EDWIN J. MOHR, manager of plant operations, the Symington-Gould Corp., Rochester, N. Y. and the Gould Coupler Corp., Depew, N. Y., recently retired because of ill health, after nearly 30 years service with the Symington-Gould Corp. and its subsidiary and predecessor companies. Former assistant managers of plant operations, W. H. HARTWIG at Rochester and D. P. MURPHY at Depew, have been appointed production managers for the respective plants.

♦ ♦ ♦

BERTRAM G. PARKER, president, Youngstown Foundry & Machine Co., Youngstown, O., recently was made president of the Youngstown & Suburban Railway Co.

♦ ♦ ♦

KENNETH H. HAMBLIN, formerly superintendent, Thomas Devlin Mfg. Co., Burlington, N. J., has been made superintendent of the Frazer & Jones Co., Syracuse, N. Y. DON MERWIN, formerly superintendent, has been made sales manager, and ROY M. MOON and JOSEPH M. DICKEY have been appointed assistants in sales.

♦ ♦ ♦

MORRIS E. LEEDS, founder and president of Leeds & Northrup Co., Philadelphia, has assumed position of chairman of the board of directors and CHARLES S. REDDING, vice president in charge of research and engineering has been made president.

♦ ♦ ♦

DR. W. A. WESLEY, International Nickel Co., research laboratory at Bayonne, N. J. was awarded the gold medal of the American Electro-Platers society at the twenty-seventh annual convention held recently in Asbury Park, N. J. The award was made in recognition of Dr. Wesley's paper on "Physical Properties and Uses of Heavy Nickel Deposits."

♦ ♦ ♦

WILLIAM G. REICHERT has resigned as metallurgical engineer, Singer Mfg. Co., Elizabeth, N. J., to become metallurgist at the Mahwah, N. J. plant of the American Brake Shoe & Foundry Co. Mr. Reichert has been associated with the Singer company since 1913 first as chemist, then as metallurgist and later as metallurgical engineer. After graduation from high school, he attended the Polytechnical Institute of Brooklyn where he received a degree in chemical engineering in 1923. Mr. Reichert has been interested in foundry development, methods of sand control, conservation and reclamation and has presented a number of papers before chapters, local associations and national meetings.

♦ ♦ ♦

ROY E. LEE recently was made superintendent, Newbury Mfg. Co., Talladega, Ala. Mr. Lee was appointed assistant superintendent of Ornamental Foundry Co. division of the Alabama Pipe Co. in 1927, and later was made superintendent. In 1935 he was transferred to the Union Foundry Co., a subsidiary of Alabama Pipe. In March of the following year he was made superintendent of the Peerless Foundry Co., Cincinnati, and on Aug. 1, 1938 became general superintendent of the Crane Enamelware Co., Chattanooga, Tenn.

♦ ♦ ♦

DAVID R. CALHOUN has been appointed manager of the industrial division of the Wilkening Mfg. Co., Philadelphia. Mr. Calhoun received his engineering degree from Drexel Institute of Technology in 1934. WEBB PEDRICK, grandson of the inventor of the process of piston ring manufacture employed by that company, succeeds Mr. Calhoun in the engineering department. Mr. Pedrick joined the Wilkening organization in 1936 and has been engaged since then in the experimental and research division of the engineering department.

♦ ♦ ♦

HORACE A. DEANE has resigned his position with Deere & Co., Moline, Ill., to become connected with the American Brake Shoe & Foundry Co., New York. Mr. Deane was graduated from the University of Illinois, Urbana, Ill., and has been connected with Deere & Co., since 1920. He worked as chemist on iron, steel, nonferrous and miscellaneous materials, and also as general metallurgist in the heat treatment of steel, etc. For the past few years he has devoted most of his time to foundry problems including not only metallurgical processes, but also general methods and costs. Mr. Deane is chairman of the Quad-City chapter of the A. F. A.

AN ENGLISHMAN GROWS ENTHUSIASTIC might well be the caption for this series of illustrations of J. E. Hurst, technical director, Bradley & Foster Ltd., Darlaston, England and past president of the Institute of British Foundrymen. The photographs were taken by William W. McCulloch of the American Cast Iron Pipe Co., Birmingham, during Mr. Hurst's recent visit to many foundry centers in the United States

HERE'S A QUIZ-
FOR FOUNDRYMEN
with the ab-so-lute-ly
correct answers!
Q.—Must top-grade core oil have good binding qualities? A.—Yes sir!
Q.—What one word means greater binding quality? A.—Penolyn is IT!
Q.—What core oil is famous for consistent uniformity and complete decomposition for clean-out?
A.—Penolyn!
Q.—What causes blow-holes in castings? A.—An excessive amount of gas generated by the core.
Q.—Then how can you prevent excessive gas? A.—Simple! Use Penolyn!
Q.—Name 4 other causes of core deformation. A.—Too much smoking, swelling or cracking under heat, long storage periods and absorption of moisture from atmosphere or mold. All headaches! But not with Penolyn!
Q.—Do you use any particular core oil exclusively? If so, why? A.—Sure ... Penolyn! ECONOMY is my main reason. I get practically no rejects ... rejects are mighty expensive mistakes! And Penolyn helps me keep a closer control over all my foundry operations. Another thing: since I took to Penolyn EXCLUSIVELY, I've been producing castings that keep my customers RE-ORDERING!

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PITTSBURGH, PA. (Formerly Pennsylvania Lubricating Co.)

NEW YORK • CHICAGO • DETROIT • ST. LOUIS

Reading

SECOND annual picnic and golf tournament of the Reading Foundrymen's association was held at the Manor Golf club, Saturday June 24 with an attendance of over 300. The outing was one of the greatest shindigs held by the foundrymen in that part of the country, according to the consensus of opinion of those who attended. A golf tournament was participated in by over 100.

Results of the tournament were as follows: Wilmer Faber, with one over par 70, copped the prize for low gross. In Class A, those with handicaps up to 16, G. R. Parry and L. W. Park tied with a net of 69. Parry had 86-16—69, while Park had 83-14—69. In Class B A. Van Wie, with 83-20—63, took top honors. Special prizes were awarded for the low scores on three holes which were selected at random. The winners were John Ciabattoni and John R. Bingaman, both of whom had 10 strokes for the three holes. In the kickers' handicap there was a tie between R. I. Schumo, S. W. Herring and Armand Henne. High gross honors were divided by H. F. Oschell and D. C. Moyer, and Norman Keeler, all of whom had 128.

Feature of the afternoon was the baseball game between the foundrymen and supply men. The foundrymen were captained by Charlie Mundell, Fairmount Foundry Inc., Hamburg, Pa. and the supply men's team by Jimmie Hatten Sr. The foundrymen took an early lead scoring 40 runs in the first inning; the supply men came back strong in the succeeding innings, and won the game in the end of the fifth when it was called by agreement with a score of 129-116. The prize, which was presented in the evening to the winning supplymen's team consisted of a beautiful, handpainted loving cup, net weight 88 pounds.

A beautiful engraved cocktail set was presented to our president, Julian B. Greenstreet, as a token of appreciation on the part of the members for his efforts in helping to build up the Reading Foundrymen's association.

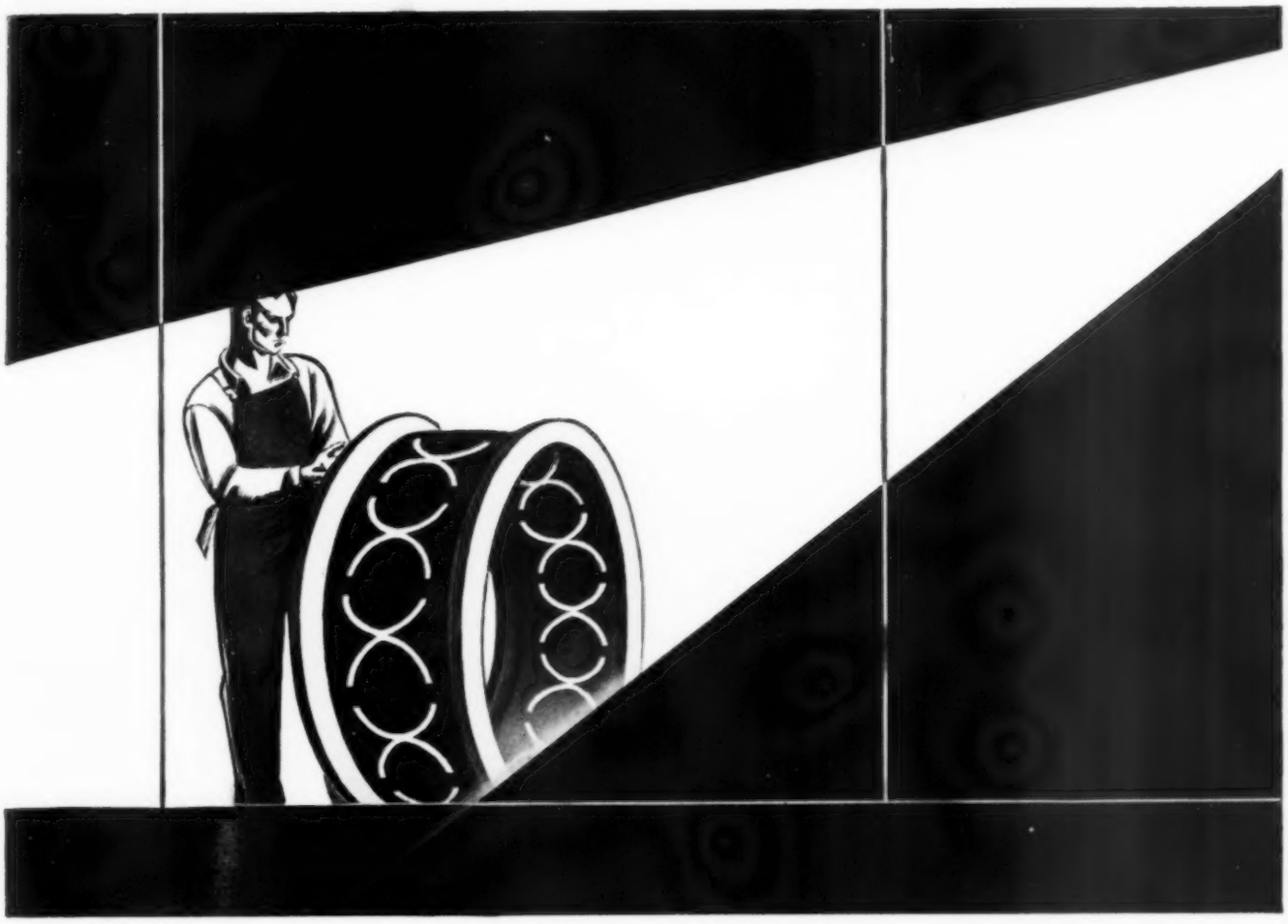
The prize to the man who came the longest distance to attend the picnic was presented to Don Marshall who came from Buffalo, who received a traveling kit in a leather case. An electric clock was won by J. M. Robb Jr., Hickman, Williams & Co.; Bill Schneider won a radio, and C. W. Yost of E & G Brooke Iron Co. won a table lamp. Numerous other prizes were awarded to members and guests Awarding of prizes was concluded by presenting a beautiful live ham to the chairman of the entertainment committee, H P. Good. Well-bedecked with ribbons and rosettes, and sprinkled with perfume, Oscar, (the name of the pig) took an immediate liking to "Goody." A floor show was enjoyed by those present and this ended the festivities of the day.—*H. C. Cummings, secretary.*

Philadelphia

A RAINY day did not interfere with the annual outing and plant visitation of the Metropolitan Philadelphia chapter of the A. F. A. on June 29. About 400 foundrymen and friends gathered at the plant of the Pusey & Jones Corp., Wilmington, Del., to witness the launching of the U. S. government lighthouse

(*Continued on page* 40)

More than 300 attended the second annual picnic and golf tournament held by the Reading Foundrymen's association



MEETING THE UNUSUAL...

Exceptional service requirements bring unusual problems, demand modern materials.

Consider, for example, the case of a manufacturer of textile braiding machines. Two cylindrical carrier head castings made unusual demands. They are 5 feet in diameter, weigh 850 and 1450 pounds respectively and have curved slots in which the carriers travel at high speed. Therefore unusual wear resistance was required. Furthermore, in addition to high strength, extreme accuracy in the finished casting and freedom from strains was essential.

The manufacturer found exactly the required physical and fabrication qualities in Chrome-Molybdenum Cast Iron—the necessary hardness and strength, good machineability and dependable response to stress relief treatment after machining.

Rechecking your own material specifications may disclose places where Molybdenum Iron will produce better results, or lower costs, or both. Our technical book, "Molybdenum in Cast Iron", will be sent free on request to production executives and engineers interested in better iron.

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Climax Mo-lyb-den-um Company
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MOLY

(*Continued from page* 38)

tender MISTLETOE at 11 a. m. The launching went off in grand style and the group then proceeded to the ball room of the Grande hotel where a buffet luncheon was served.

After the luncheon those interested in malleable iron were entertained by the Eastern Malleable Iron Co., where a 35-ton heat was run off at 2 p. m. which was followed by a visit through the immense plant. Later in the afternoon the group returned to Pusey & Jones Corp. where an inspection of the foundry was made and another pour was witnessed.

At 7 o'clock the group met again at the Grande hotel for a steak dinner which was delightfully prepared and served. The chairman, Harold Henszey, made a few remarks—there were no speeches—principally to introduce the newly elected chairman for the coming year, William C. Hartmann, Bethlehem Steel Co. Mr. Henszey thanked the group for the support given him and took occasion to compliment the committee headed by Jack Robb for the splendid turn-out and efficient manner in which all details of the visitation were planned.

After dinner the group was entertained with a wonderful floor show and the committee had assembled a lot of prizes.—*J. T. Fegley, chairman, publicity committee.*

Southern California

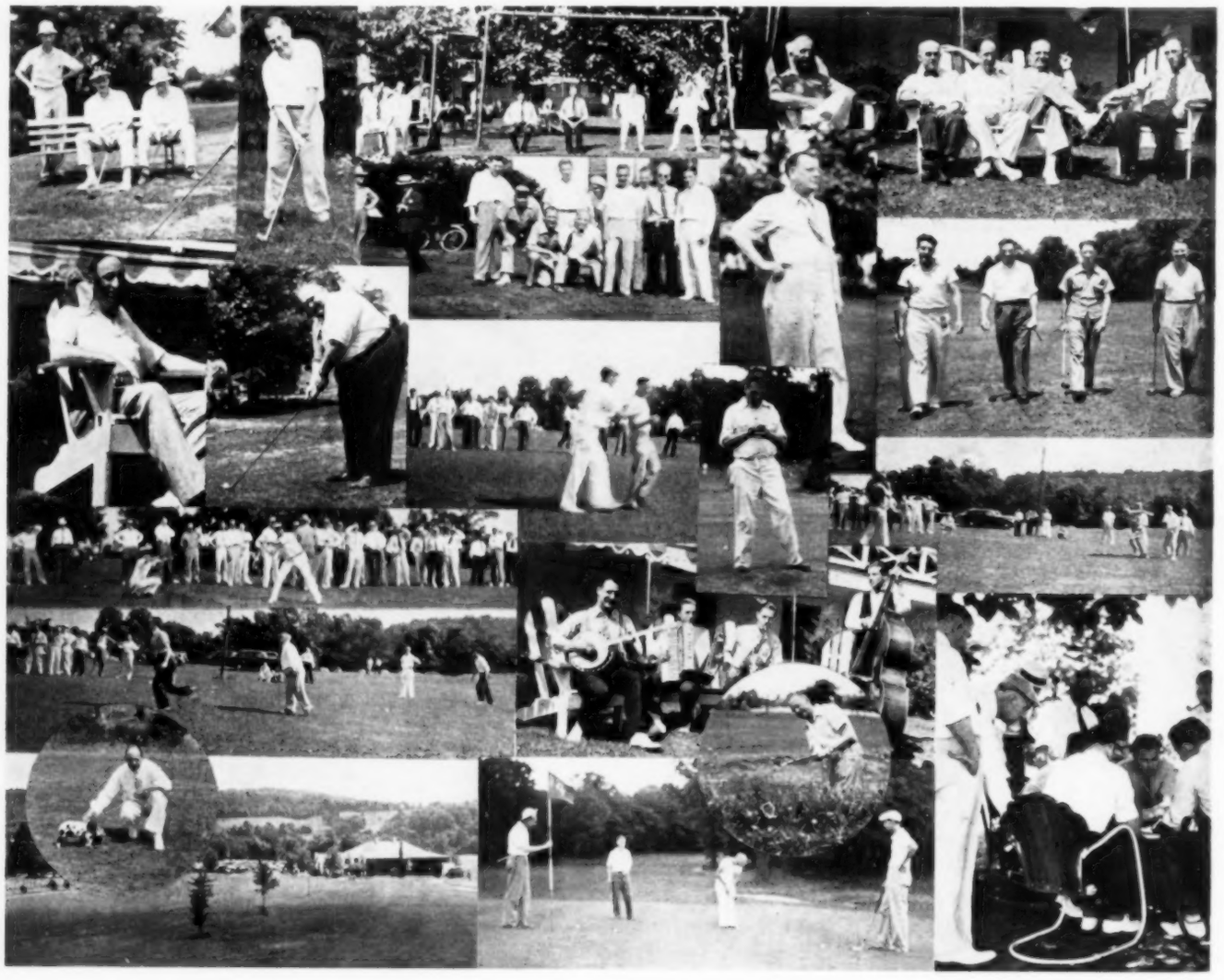
LAST regular meeting of the year of the Southern California chapter of the A. F. A. was held June 22 at the Clark hotel, Los Angeles. Chairman J. G. Coffman presided at the dinner meeting which included a musical program arranged by the entertainment committee. The coffee talk consisted of a picture, "From Mine to Consumer" shown through the courtesy of the Anaconda Copper Mining Co. and the American Brass Co. B. G. Emmett, Los Angeles Steel Casting Co. reported briefly on "Side Lights of the Past Convention."

Technical program included an interesting talk by George W. Effinger, Snyder Foundry Supply Co., Los Angeles on "Mechanical Cupola Charging." The talk was illustrated by use of a model demonstrating unit of working cupola charging equipment of the Whiting Corp.

Since the meeting also was the annual business meeting of the chapter, the group elected the following officers to serve for the year 1939-40. Chairman, Albert G. Zima, International Nickel Co.; vice chairman, James B. Eppley, Kinney Iron Works; secretary, Walter F. Haggman, Foundry Specialties Co.; treasurer, Charles R. Gregg, Reliance Regulator Co. Directors to serve 2 years: R. J.. Crichton, American Brake Shoe & Foundry Co.; Pasquale Arpea, Axelson Mfg. Co.; J. G. Eberhart, Kay-Brunner Steel Products Inc.; Thomas J. McGraw, James E. McGraw & Son. The following present directors have one additional year to serve: John E. Wilson, Climax Molybdenum Co.; William Feltes, Westlectric Castings Inc.; Silas R. Kimberly, Los Angeles Steel Casting Co.; D. E. Lingenfelter, Quality Foundry & Mfg. Co.; J. G. Coffman, Los Angeles Steel Casting Co.

(*Continued on page* 42)

Reading foundrymen enjoying a good time at the outing. Photos courtesy H. C. Cummings



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Recent developments obtain faster operation, greater economy in air consumption, fewer adjustments and minimized wear.

General operating conditions have been advanced beyond all previously accepted standards.

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TIME PROVES VALUES

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MOULDING MACHINES

(*Continued from page* 40)

The chapter extended a rising vote of thanks to the retiring chairman, J. G. Coffman. Chairman elect, Albert G. Zima, announced the appointment of W. B. Bailey Jr., Pacific Metal Co. Ltd., as chairman of the entertainment committee.—*M. S. Robb, secretary.*

New England

THE Mid-Summer Outing of the New England Foundrymen's Association will be held on Wednesday, Aug. 9, at Providence, R. I., rain or shine.

Central New York

CENTRAL New York chapter of A. F. A. will hold its annual picnic Aug. 26. Leo Lonergen, Morris Machine Works, Baldwinsville, N. Y. is chairman of the committee on arrangements, and all planning to attend should notify Mr. Lonergen not later than August 24. All foundrymen, equipment and supply men are cordially invited to attend the outing.—*L. D. Wright, secretary.*

Wisconsin

THE following members of the Wisconsin chapter of the A.F.A. have been appointed to these committees: *Program*, E. Roth, Paul Power, C. N. Spidell, E. Meyer, Ray Tanner, William Hambley, George Dreher; *Publicity*, Roy Jacobs; *Attendance*, H. R. Donald, Ray Flansburg, Arthur Harter, E. Gruetzmacher, and Everett Miller; *Safety and hygiene*, W. J. Grede, W. J. Donnelly, L. S. Peregoy, C. A. Gutenkunst, W. F. Bornfleth; *Membership*, E. B. Hansen, C. F. Patzke, Earl Johnson, Walter Gerlinger and William Hambley; *Entertainment*, E. N. Carpenter; *Apprentice*, William Watson Jr., Adolph Schott, C. E. Silver, Oscar Woehlke, George Zabel, Paul Riedel, R. S. Falk, Robert MacDonald, and C. W. Morrissette; *Vocational guidance*, Ray Flansburg; *Golf*, T. E. Ward, B. D. Claffey, R. M. Jacobs, M. J. Carpenter, W. F. Bornfleth, John Bing, W. H. Underwood, H. Boschulte, and H. E. Fellows.

THIS bronze statuette, especially cast for the Chicago chapter, American Foundrymen's association, was awarded L. H. Rudesill, Griffin Wheel Co., Chicago, June 12, upon his retirement as 1938-1939 *chairman of the chapter. Similar awards also were made to other past chairmen, who include Don J. Reese, International Nickel Co., New York; James Thomson, Continental Roll & Steel Foundry Co., East Chicago, Ind.; Leon J. Wise, Chicago Malleable Castings Co., Chicago; and Harold W. Johnson, Greenlee Foundry Co., Chicago.*

Quad City

QUAD-CITY chapter of the A.F.A. held its annual outing and picnic at Eagles Country home on Rock River, Moline, Ill., with golf at Short Hills Country club on Saturday, June 17. This proved to be a very suitable and enjoyable closing session of the year's program for some 125 members present. A chicken and fish dinner was served in good old country style during the latter part of the afternoon. Sports, games, and usual get-togethers with refreshments was in evidence during the afternoon, to the music of Jimmie O'Bette and his accordian. Prizes for those in attendance and those playing golf were given during the afternoon. There were many guests from other chapters at the outing. Some of the chapters represented being Chicago, St. Louis, Rockford,

(*Concluded on page* 45)

Close harmony featured Northern Illinois-Southern Wisconsin out ing. Photos courtesy John Bing, A. P. Green Fire Brick Co., Milwaukee

(*Concluded from page* 42)

Waterloo. This affair was held Saturday June 17 under the direction of the picnic committee, J. H. Ploehn, chairman.—*J. Morgan Johnson, secretary-treasurer.*

EDITORS NOTE: A photograph taken at the outing is reproduced on pages 32 and 33 of this issue.

Northeastern Ohio

ANNUAL summer outing of the Northeastern Ohio chapter was held on June 24 at the Lake Forest Country club, Hudson, O. More than 200 were present at the evening dinner which climaxed the outing, while approximately 130 were entered in the golf tournament. One of the features of the program was the annual 7-inning soft-ball game between the vendors of equipment and supplies and the foundrymen.

Although the foundrymen's team ran up the score in the early stages of the game, the vendors came back strong in the fifth inning, and the game ended with a 7 to 6 score in favor of the foundrymen. Bob Kennedy, genial secretary of the A. F. A. acted as umpire, and gave his decisions like a professional. Final feature of the outing was presentation of prizes after the dinner. Carl Larsen, Osborn Mfg. Co., Cleveland, received first prize in the golf tournament for a low gross score of 77.—*Edwin Bremer.*

St. Louis Chapter Plans Conference

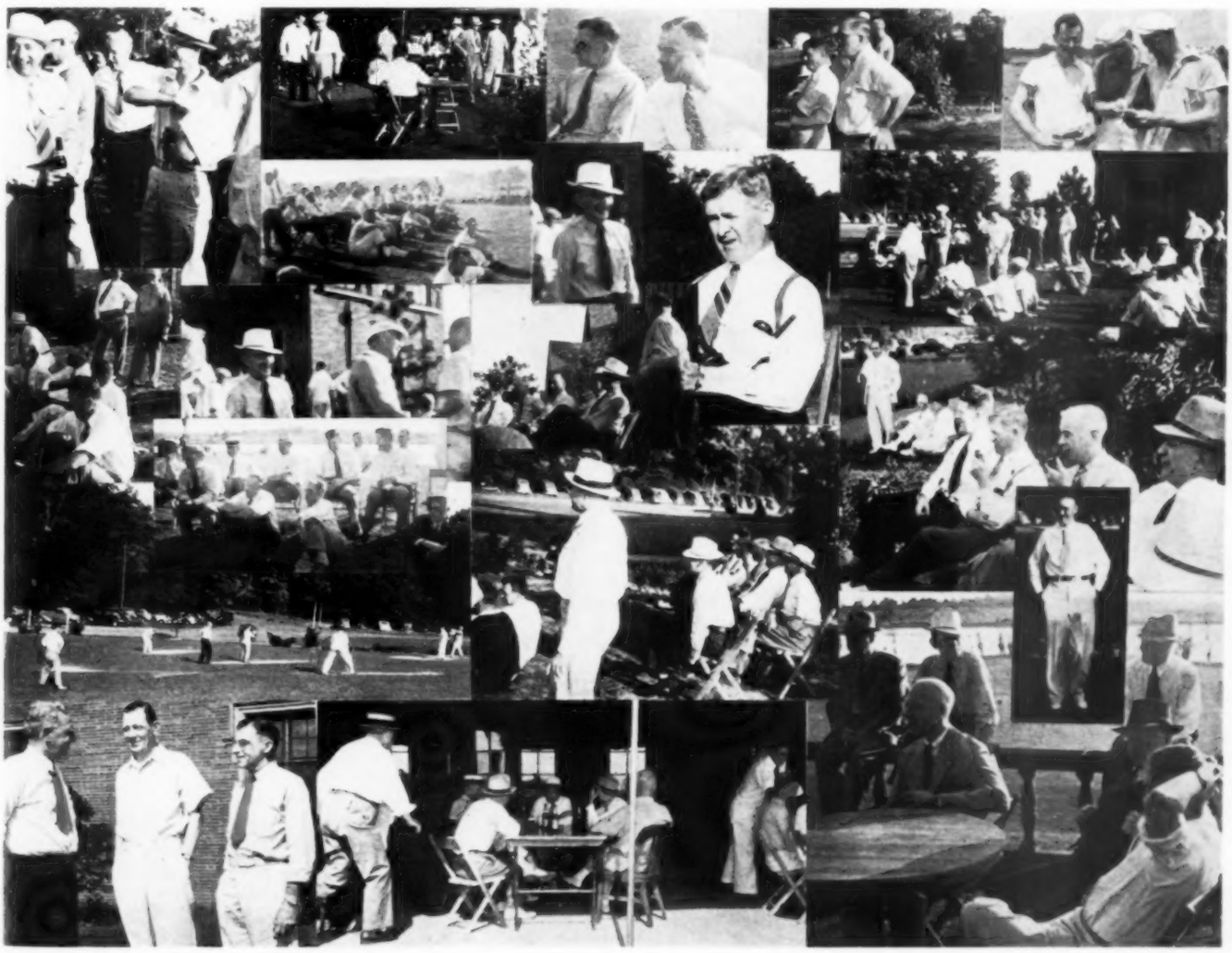
Regional Conference committee of the St. Louis district chapter of A. F. A. is arranging a program of interest to the several branches of the foundry industry to be held in the Jefferson hotel, St. Louis, Oct. 5 to 7 inclusive.

The first day will be devoted to registration and plant visitations, followed by a smoker in the evening. Opening session will be held Friday morning, Oct. 6, and will consist of a general interest joint session on the subject of "Design as Related to Casting Problems." Chairman of the session will be Lester N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala., and vice president of the A. F. A.

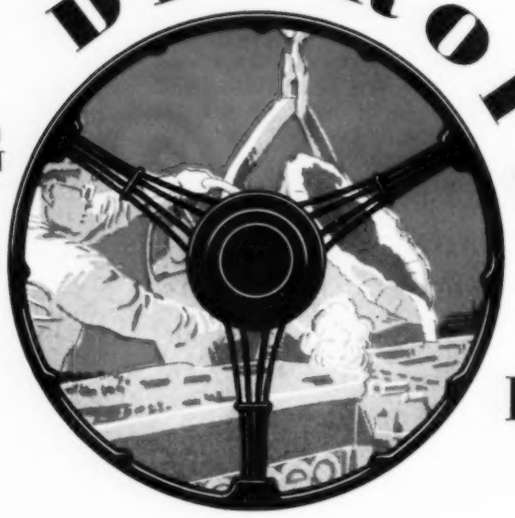
At noon a luncheon will be held at which Lee E. Everett, Key Co., E. St. Louis, Ill., and chapter chairman will welcome those present, and T. Dysart, president of the St. Louis chamber of commerce will be the principal speaker. In the afternoon three sessions will be held of which a general sand session under the direction of T. C. Hamlin, U. S. Radiator Corp., Edwardsville, Ill. will occupy the first part of the afternoon. The remainder of the afternoon will be devoted to simultaneous sessions on steel and gray iron. The conference dinner will be held at 7 p.m. with Lee E. Everett as chairman, and Karl Landgrebe, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., as speaker.

Saturday morning, Oct. 7, will be devoted to three round table discussions on gray iron, steel, and nonferrous metals. In addition a special student session will be held under the direction of C. Y. Clayton, Missouri School of Mines & Metallurgy, Rolla, Mo. Speaker will be C. R. Culling, Carondelet Foundry Co.

Northeastern Ohio Chapter held its annual outing at the Lake Forest Country club, Hudson, O., on June 24. Photos by Bob Walters, Harry Richey, Mike Dwyer and Edwin Bremer



AMONG DETROIT FOUNDRIES



By A. H. ALLEN
Detroit Editor, The Foundry

FOUNDRYMEN who might have been privileged to witness the recent preview of the new Ford tractor would have marveled at the excellent job Ford engineers have done in adapting castings to construction of that unit. It is virtually all castings—aluminum, magnesium, copper-silicon steel and a new *AA* steel. Wherever possible, light metals have been used to hold down weight, but main structural members are cast steel made in the Ford foundry. Overall weight of the tractor is only 1700 pounds. Out of this total, 600 pounds of steel castings are used, exclusive of the motor.

Many Castings in Tractor

These castings can be divided into two groups—those of copper-silicon, and those of the new *AA* metal. The former includes the rear wheel disk, 102 pounds as cast and two required per tractor; transmission case 72 pounds; right and left rear axle housings, 51 pounds each; a large so-called banjo casting for the rear assembly 108 pounds; and a front transmission case cover weighing 35 pounds.

The second group comprises the front axle, weighing 25 pounds and of a telescoping type to permit adjustment of the front tread within the limits of 48 and 76 inches in 4-inch steps; two curved beams, one long and one short, 40 and 35 pounds respectively, which connect with the hydraulic mechanism and the implement so that the latter can be lifted out of the ground; a cross brace 25 pounds; three front spindles 37 pounds each; and a saddle for the front suspension weighing 24 pounds.

An extensive program of improvement is nearly completed in the Ford foundry to handle the additional requirements of tractor castings. For example, a large amount of cleaning equipment has been installed, with capacity to handle 200 sets of the tractor castings per 16-hour day. Naturally a wide range of smaller castings is used in the tractor as well as in the construction of the various farm implements built specially for use with the new tractor.

The Dodge foundry is installing machinery for cleaning all transmission gears by blasting. These gears formerly were wire brushed by hand. Installation of mechanical devices for doing that work marks the first use of that type of cleaning on transmission gears, although the method is used for ring gears and pinions.

Introduce Fluid Drive

A number of changes have been made in transmission designs for the Chrysler lines for 1940, reportedly for the purpose of accommodating the new fluid drive mechanism which was offered only on the Chrysler Imperial in 1939 models. Those who have driven cars equipped with the fluid drive state it provides an exceptionally smooth ride. For example, one test stunt which can be done is to let a car coast slowly backward down a grade, then step on the accelerator with the gears in first speed forward position. The car will gradually slow to a stop and then start ahead smoothly, all the friction incident to reversal of the car's direction being absorbed by the fluid drive. About the only difficulty which has been experienced with the device, according to reports, is an occasional leakage of some fluid from the joint between the two housings which enclose the impellers. This is no insurmountable difficulty, merely inferring the need for a tighter seal between these pressed steel housings.

Installation of a rubber conveyor or moving pipeline as it is called, in a foundry in the electric furnace building at Ford is reported to be operating successfully. The conveyor, a closed loop about 200 feet in length, has been adapted to elevating sand from floor hoppers to overhead mixers. This type of conveyor, comprises two halves of a special cross section which lock together as they are twisted slightly, and then can be opened for charging by twisting in the reverse direction.

Swinging Into Production

The large automotive foundries are swinging into production on 1940 castings, as the date for introduction of new models draws near. Previews of several new models will be staged this month—Studebaker Aug. 15, Packard Aug. 8, and the Chrysler lines probably around Aug. 22. Packard schedules called for building about 5000 cars during July, and subassemblies had started even before July 1. Officials stated that employment by the end of this month would reach 13,500, that the new lines probably would be reduced further in price.

Strike of tool and die makers in General Motors plants has been a serious blow to new model introductions by corporation divisions, and probably will result in several weeks postponement in unveiling of 1940 creations.

First shipment of parts for the 1940 Ford models is scheduled for Aug. 21. Assemblies of 1939 models were slated to stop Aug. 18, indicating that final assemblies of the new models probably will start immediately after Labor day.

Save Money— MODERNIZE

YOUR DUST CONTROL EQUIPMENT

You can modernize your old dust collector with new Sly flat cloth bag filter parts including the *new Sly shaker mechanism*—all at small outlay, and realize substantial savings in operating costs.

This change-over provides additional filtering capacity, or the same filtering capacity with less space (the balance of the case often being converted into a classifier or settling chamber).

By connecting the dust pipe or pipes to this classifier section the heavier dust particles entering the filter will be deposited in this section, allowing only the finest dust to reach the cloth bags.

The *new* shaker mechanism saves operating costs. Its jarring action thoroughly cleans the bags, thereby keeping the static resistance of the filter at a minimum, which reduces the power required at the exhaust fans.

Scores of plants have made this change-over and effected outstanding savings. Send for the complete story.

THE W. W. SLY MANUFACTURING COMPANY

Branch Offices in Principal Cities

4753 Train Avenue, Cleveland, Ohio

View shows an old dust arrester case rebuilt with new Sly cloth bag filter parts. Sufficient space was available to place the bags in rows three tiers high. Each bag has 22 square feet of cloth and is held under proper tension by springs.

When we furnish new parts the shaker device mechanism includes a gear head motor with base, support and housing (not shown). The shaker mechanism is designed to flex, beat and shake each bag over 200 times per minute.

Cut shows new Sly filter for collecting dust exhausted from an 8'x10'x7'3" high blast room. With Sly parts you can make your old dust collector equally modern.

BLAST CLEANING EQUIPMENT SLY TUMBLING MILLS

DUST CONTROL EQUIPMENT FOR EVERY INDUSTRIAL PURPOSE

Reader's Comment

EDITOR'S NOTE — *Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of The Foundry or of Its Editors.*

In New Zealand

TO THE EDITORS:

In the May number of THE FOUNDRY page 118 we note a reference to our acceptance of a license for the manufacture of meehanite metal.

So far so good, but we are located in New Zealand, not Australia.

Some how or other the two countries seem to get very much mixed in correspondence. We should be glad to have this correct as we are 1200 miles apart.

PERCY W. FRAMPTON,
Works Manager
Booth, Macdonald & Co. Ltd.
Christchurch, New Zealand

Glass House Molds

TO THE EDITORS:

A confirmed reader of "Questions and Answers" in THE FOUNDRY I would like to make a few remarks in line with the item in the July issue on glass mold irons. Probably they will present nothing new, but this question of mold irons merits thorough consideration of many more factors than may be represented in: "What analysis should we use?" Analysis well may be the hidden rock that will wreck the ship. Glass temperature, weight of glass, speed of production, mold cleaning methods are important items of interest in deciding on the right iron. In other words, an iron suitable for small ware probably would be undesirable for use on heavy tumblers and most assuredly would not hold up under the production of heat resisting wear.

All the component parts of a mold hardly can be made of one type of iron. Scoring or wearing effect of the chilled glass on the plunger requires a harder and more wear resistant iron than usually would be necessary for the mold. Split molds such as two and three-part molds may require special study because of wear.

It would seem that a study of the requirements of the glass maker first should be made and then the composition of the irons and their ultimate treatment naturally would follow in order. Use of alloys and their effect on thermal expansion, growth and promotion or control of scaling, should be understood. Particularly, carbide forming elements must be handled with considerable care and knowledge. Finally, if the iron contains alloys, the beneficial effect of full annealing should be considered.

These remarks could be amplified —and probably clarified—but possibly they will present a few factors that are of fundamental importance in glass mold making. Incidentally, *Gray Iron Metallurgical Practice*, by C. H. Lorig, in the March issue of THE FOUNDRY would make good reading for any person contemplating mold iron making.

ROBERT M. SCAFE
105 West Walnut street,
Washington, Penna.

British To Meet

Institute of Metals (Great Britain) will hold its thirty-first annual meeting in Glasgow, Scotland, Sept. 5 to 8. Conference headquarters will be at the Institution of Engineers and Shipbuilders. W. Murray Morrison will deliver the seventeenth autumn lecture on, "Aluminum and Highland Water Power." Seven papers will be presented at the technical session relating to such subjects as thermal conductivity of copper-nickel alloys, anodic oxidation of aluminum, direct oxidation of zinc, tarnish resistant silver, dendritic structures, crystal orientation, segregation in copper-silver alloys, magnesium alloys, and mechanical properties of some wrought alloys.

Book Review

Patternmaking for Engineers, by J. G. Horner, revised and enlarged by Philip Gates; cloth; 390 pages 5 x 8 inches; published by The Technical Press Ltd., London; and may be purchased through THE FOUNDRY and in Europe by the Penton Publishing Co., London.

Merit of this book is indicated by the fact that this is the sixth edition of a work originally compiled from a series of articles presented in the technical press by a man particularly well qualified for the task. In the preface to the first edition the author hopes that the book will be found a *vade mecum* of a trade in which he has been engaged as apprentice, journeyman and foreman for a period of 25 years.

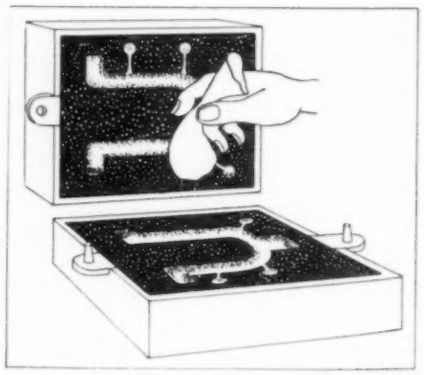
The material is for the benefit of pattermakers, draftsmen lacking in shop training, pupils in schools and apprentices in shops, employers and managers in engineering works and to all others who seek more than a mere smattering of knowledge relative to the most important branch of engineering construction. Although essentially a treatise on patternmaking, the text in the majority of instances is extended to many features connected with making the molds from the patterns and for that reason should make the book acceptable to foundry readers. The text is supplemented with 558 illustrations.

Scope of the work is indicated by the list of chapter headings: Joints in patterns and molds; principles of pattern construction; details of pattern construction; core prints; coreboxes; cores and drawbacks; molding boxes; engine beds and base plates in general; engine cylinders; engine cylinders struck in loam; fly wheels, miscellaneous engine work; boiler fittings and mountings; pumps, cocks and valves; columns and pipes; miscellaneous pipe work; fluted and ornamental columns; pulleys and metal patterns; sheave wheels; chain barrels; machine tools; water wheels and turbines; screws; chilled work; loam patterns; machine molded wheels; patterns for plate molding; molding machine practice; pattern shop equipment; estimating weights of castings from patterns; storage of patterns; appendix containing a wide variety of formulas, rules and tables.

Cement Is Applied As Mold Facing

By A. H. Waychoff

Men with a hobby of making small lead or babbitt castings in the home workshop usually have trouble in securing a smooth surface on the castings poured in sand molds. Steam from the sand produces blow holes and other imperfections. To prevent this trouble, the mold is left open until the metal is ready to pour. A small amount of portland cement in a pounce bag is dusted over the face of the mold. The mold then is closed and poured. The cement absorbs the surface dampness and forms a dry face on which the metal lies quietly.



Cement is dusted over mold face

SPO TALKS PRACTICALLY

A frankly literal record of a foundry situation — and how it was handled.

More and more short horn cattle are being raised in the Southwest. These big, beefy steers seem to have been meant for the market and money-making. Here is how a manufacturer cashed in "meatily" on an assortment of short-run orders.

The Situation. You have a number of short-run jobs, including this large "saddle" casting. The orders average from 50 to 100 pieces each. You don't want to rig up for long-pull production on any one of them. The "saddle" mold is complicated as well as heavy, requiring four set cores and five shrink chills per mold. Flask size: 21x32"; cope, 12"; drag, 6". Casting dimensions (extreme): length, $22\frac{1}{4}$"; width, $14\frac{1}{4}$"; height, $15\frac{3}{4}$". Two molders would turn out around 20 molds per day, which isn't enough.

The Contribution. A proposition is laid before you. Group all your jobs of a similar size. For the "saddle", make cope and drag patterns. Make the copes on a SPO No. 214 Jolt Squeeze Strip Machine. Make the drags on a SPO No. 413-D Jolt Squeeze Power Rock-over Pattern Draw Machine. Though you have never made this part on a molding machine, you accept the recommendation.

The Result. A 3-man crew puts up 14 molds per hour, or 84 in a 6-hour day. Your output increases 180% proportionately (56 vs. 20 for two men). Slip flasks are used and "rotated" constantly. No bars are needed, thanks to SPO's uniform ramming qualities. A tough job wh ch might have "jimmied up" production has become a source of satisfactory profit.

The services of a SPO engineer are at your call.

"The Saddle"... one of a group of short-run jobs that were made at a profit on SPO Molding Machines

SPO designs and builds both molding machines and pattern equipment, and guarantees them unconditionally to produce castings which will be in accordance with your specifications.

SPO

INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators, and Patterns for Production

East 61st Street and Waterman Avenue · · Cleveland, Ohio

THE last time I was over here," said Bill, "I showed you a clipping from a paper handed me by a lad I met in Cincinnati while the two of us—and of course several hundred others—were attending the A. F. A. convention in the old historical settlement on the Ohio, referred to for many years as the Queen City of the West."

"What is this going to be" I inquired." If you intend to give me a handfull or two of information about Cincinnati—stuff you probably pinched out of the encyclopedia—you can save yourself the trouble. I have read the story. I have been in the city on several occasions. I have particular reason to remember the kindly, courteous and generous treatment accorded me by several citizens in their public and private capacities. So, as I say, you can turn off the tap right now. What do I care who settled the town or for that matter who christened it? While on the subject of names I often have wished the old boys had adopted a name easier to spell. I never can remember whether the double *n* comes before the second *c* or after the second *i*. Fortunately the spoken appelation Cincy presents no difficulty. In my younger days I occasionally heard a touring brother refer to the headquarters town as Cincinnati, or more frequently Cincinnatah with the accent on the *nat*, but this always was regarded as a bit of affectation, putting on the dog and all that kind of thing. The entente cordiale was slightly dimmed. Faint suspicions that all was not weil arose in the minds of the other hearty and fortright lads accustomed to the briefer Cincy. Furthermore and in addition thereto.—"

"You are putting on the wind too soon. You might wait at least until I get a few charges into 'er. This has nothing to do with Cincinnati. I merely mentioned the city as a kind of a preliminary. Dash it all, when a thing happens, it must happen some place and unless I tell you where it happened, how are you going to know?

"This here now cynical chemical guy I was telling you about handed me the clipping describing woman in chemical terms, and not wholly complimentary terms at that. I don't know if this lad wrote the thing himself in the first place—I wouldn't put it past him—but he seemed to consider that he was doing me a favor when he allowed me to have a look at it. Ignoring the fact that presumably I was able to read ordinary English he poked his fore finger along the lines to make sure that I should not miss any of the gems.

" 'How's this one?' sez he. " 'Chemical Properties: Very Active. On slightest provocation shows strong affinity for gold, silver, platinum and precious stones. Violent reaction when left alone. Ability to absorb unlimited amount of expensive food at any time. Undissolved by liquids. Turns bright green when placed beside a better looking specimen. Ages very rapidly. Fresh variety has great magnetic attraction. Highly explosive—' "

Cincy is good enough for him

"I know all that," I said, "you showed me the thing before. Clever and all that, but I do not think you would receive any great or enthusiastic applause if you were to read the gem at home, or in front of a woman's club. You would have reason to think you had fallen into a wildcat's nest. Seems to me the late brother Scott had a word or two to say on the subject of women. Let's see how does it go: O woman in your hours of ease, uncertain, coy and hard to please. When pain and anguish wring the brow, a ministering angel thou."

"Ministering angel, hey? That is not the way the chemical guy would have written it. He would have hit it off something like this: Oh, woman was always a problem and caused many a man to go on a bat. When she shops high and low, spends all her dough and brings home what she calls a hat!"

"Why," I exclaimed admiringly, "I don't believe Mr. Scott ever turned out a neater rhyme than that and mind you he was a journeyman poet who was paid handsomely for his work."

"Scott? Was that the fella they called Great Scott, or was he the bird who appeared for many years in the advertisements dressed in oil skins and a sou'wester with the grandfather of all cod fish hanging on his back? Well, it does not matter one way or another. As for the rhyme, any person can cook up that kind of elementary stuff. Just a gentle bit of kidding. All head gear is ridiculous, if you care to view it

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ADVERTISING PAGES REMOVED

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from a rational standpoint. If you want proof, take a look through some old magazines or newspapers and note what the well dressed men and women were wearing proudly on the tops of their heads 20, 30 or 40 years ago.

"However, all this idle chatter has nothing to do with what I had in mind when I started talking about Cincinnati. I merely mentioned the clipping about women by way of introducing a lady I met down there. You hear and read considerable comment about women invading many fields hitherto considered exclusively male hunting grounds. Recently a woman retired after a successful career of many years selling steel. I know of several women who conduct foundries, but so far as I know with possibly one exception this lady I met in Cincinnati is the only woman in the entire e pluribus unum United States and foreign possessions who is engaged in the business of selling molding sand to foundries.

"Mrs. R. E. Barnes lives in Chattanooga, Tenn., her sand pits are in Saulsbury and she supplies sand to foundries in Tennessee, Alabama and Mississippi. When she started in the sand business she did not know whether castings grew on trees or were dug out of the ground like potatoes or peanuts. Today and for several years past she is competent to discuss any sand problem that arises in the foundry. She neither asks nor expects any special consideration from customers or prospects."

"How did she happen to get into this—for a woman—unusual business? Did she start with mud pies and gradually work up, or is this another movie story where the cruel old landlord is about to evict the family from the old homestead. At the crucial moment a handsome stranger, proprietor of Mammoth Castings Inc., happens to stop at the house for a drink of water for himself and a couple of quarts for his steaming motor car, or for any other reason coined on the spur of the moment when a beautiful young lady is seen on the veranda. Strolling about the grounds the handsome stranger discovers the sand deposit in the back pasture and explains to the girl that this apparently useless stuff is in great demand by people who make castings. She immediately takes charge. Makes a pot of money, marries the handsome stranger and they all live happily ever after."

"Well," said Bill, "I'll tell you. The answer is yes and no. The handsome stranger and the happy ending are in the picture, but the first meeting was many a long mile from the old homestead and at a time when neither of the high contracting parties could speak more than a word or two of the other's language. However, as you probably have noted, little Dan Cupid has developed a universal language through which a man and a maid may exchange thoughts without use of the spoken word. So far as I know certain gestures, also manipulation of the eyes never have been copyrighted. They are understood as readily by Jim and Katie on the park bench as they are by those who sit in high places."

"I have been through the mill. Carry on."

"Kindly throw your mind back about 20 years to the time the great white father at Washington bought a stack of chips and sat in at a game conducted in Europe. Through one reason and another he decided that a sprinkling of a few boys from home among the spectators would not do any harm. He offered a free trip to Europe with all expenses paid to any person sound in wind and limb, capable of marching 40 miles a day with a rifle on his shoulder and with a pack on his back containing more equipment than the average young man has when he starts housekeeping. A one way ticket was presented to each traveler with a tentative promise to supply a return ticket after the game. In thousands of homes scattered all over this broad land from Fire Island to the Golden Gate and from the Great Lakes to the Gulf a vacant chair still waits for the boy who never claimed the return half of the ticket.

"R. E. Barnes, a young civil engineer from Chattanooga, Tenn., where if you remember the cotton blooms and blows, joined the 106th Engineers, was converted into a soldier, spilled into the great war hopper on this side and eventually found himself in France where the great new European map making job was under construction. The usual bureau efficiency in those days prevented soldiers from giving any address except 'Somewhere in France,' a measure designed no doubt to produce great grief and chagrin in the minds of the enemy if the correspondence should fall into their hands. Presumably the enemy could not or did not read the daily papers.

"Now that this necessity for secrecy no longer exists, I am not violating any confidence when I state that engineer Barnes was located in Brest, the ancient fortified city near the tip of the long finger of Brittany which extends into the Atlantic ocean. Quite a place, I understand, principal of the seven great French naval stations. Satisfied that the city did not need his unceasing vigilance day and night the young American engineer took a few hours off now and again for social relaxation. He circulated blithely as young soldiers have been wont to circulate since soldiering

(*Concluded on page* 58)

One of the Seven shows Snow White there's gold in them thar hills

FOUNDRY DEVELOPMENTS AT SHORT RANGE

A RECENT development for producing thin-walled, hollow castings, described in a patent, is designed to eliminate use of steel stampings which are welded together to form a hollow body. Essentially the process involves making a solid casting, decarburizing its skin to the desired depth, and then removing the interior by raising it to the melting point. The iron used is a white iron containing 2½ per cent carbon, 1.15 per cent silicon, 0.40 per cent vanadium, and 0.40 per cent manganese. The skin of the casting is decarburized to a depth of 0.040-inch by heating 1½ hours at 1800 degrees Fahr. in moist hydrogen. Greater depths of decarburization are obtained by longer heating. Then the casting is cooled and one or more holes drilled through the skin to the interior. Holes are plugged with graphite paste to prevent decarburization, and then the casting is heated in hydrogen to 2100 to 2300 degrees Fahr. until the interior core melts. The liquid is poured out leaving a thin shell of the desired shape.

* * *

A new and superior black electroplated coating for decorative hardware, art objects, business machines, automobile hardware, and numerous other applications recently has been developed according to a report. It is claimed that the process produces a highly lustrous, deep black deposits from a solution containing essentially ammonium molybdate, nickel sulphate and boric acid. The process is said to be markedly superior in many respects to existing black nickel plating and similar black coating processes, and that the process is simple to operate in addition to easy control of the solution.

* * *

A decided improvement in physical properties of aluminum-zinc alloys is claimed through addition of small amounts of titanium, chromimum, and magnesium according to a patent. Preferred composition contains 8 per cent zinc, 0.5 per cent chromium, 0.15 per cent titanium, 0.8 per cent magnesium, less than 0.8 per cent iron, less than 0.3 per cent silicon, copper and manganese, and remainder aluminum. Aging of the alloy for 4 days at room temperature shows a tensile strength of over 33,000 pounds per square inch, a yield point of over 25,000 pounds per square inch, and an elongation of about 3.8 per cent.

* * *

Additions of very small quantities of beryllium, according to a French invention, are said to eliminate the necessity of adding substances which form a protective gas in molding sand for the production of heat treatable aluminum-magnesium alloys containing about 10 per cent magnesium.

* * *

TRACTOR recently introduced by the Ford Motor Co., Dearborn, Mich., makes extensive use of cast steel, magnesium and aluminum. High strength cast steel is used in all main supporting members and provides ample strength with minimum weight. Magnesium is used, for example, in the quadrant on which the implement shifting lever rides. Aluminum is used in the radiator grill.

* * *

Measurement of wear resistance involves so many variables that considerable difficulty has been encountered in ascertaining a true value. However, the National Bureau of Standards reports that it has developed a new procedure for measuring wear which occurs on bearing surfaces of the machinery. The methods consist of making minute indentations in the surface of the bearing with a specially shaped diamond point, and measuring the dimensions of the indentations before and after the bearing has been subject to use. Great rapidity and accuracy is claimed for the method.

* * *

Production of flanged pipe and similar castings requires careful molding practice so that during solidification of the metal, the sand will yield sufficiently to give a casting free from tears and cracks. According to a recent patent, use of sand bonded with cement as the molding medium for flanged pipe is not always satisfactory due to the fact that it is stiffer and more rigid than green sand, and does not yield sufficiently. However, the latter is overcome in sand-cement molding by making the mold (horizontal pouring) in three sections of which the center portion may be wedge shape or parallel-sided. With the wedge shape section, the angle is steep so that as the flanged casting contracts, the two end mold sections are drawn in, forcing the central wedge section out. The parallel sided section mentioned is in the form of a thin hollow sand-cement shell which is filled with ordinary molding sand so that it will crush easily.

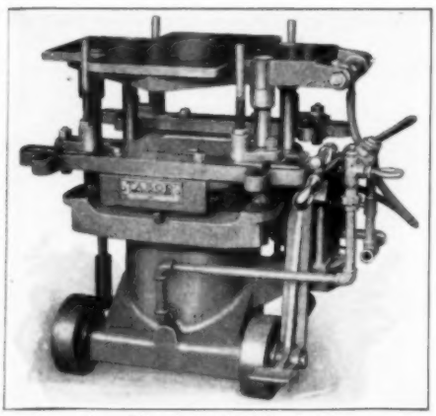
* * *

CUPOLA chargers who frequently are admonished about placing the first charge or two of iron on the bed carefully so that the coke is not shattered or disturbed will be interested in an idea proposed by a patent. It consists of placing a layer of steel shavings or steel wool on the bed which provides a resilient cushion which bears the brunt of the rapidly descending first charge. A fine idea perhaps, but listen to the boss roar that he isn't going to coddle any first iron charge by giving it a soft bed to lie on—no matter what happens!

* * *

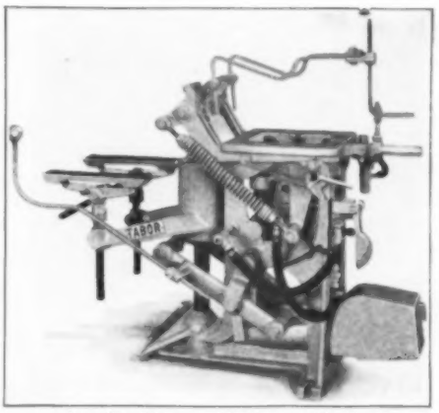
Foundrymen yet may have to become familiar with the dietician's vocabulary provided a patent description for foundry application is any criterion. For example one discusses use of proteins and carbohydrates which is not improved greatly by stating that one is soluble casein and the other lactose, both obtained by treating milk with oxalate, fluoride or metaphosphate or the corresponding acids. But, don't start to worry yet as the patent only refers to ingredients of a core binder. It is composed of 70 to 80 per cent soybean meal, and 20 to 30 per cent of a mixture containing 40 to 60 per cent each of soluble casein and lactose.

PROVED MACHINES

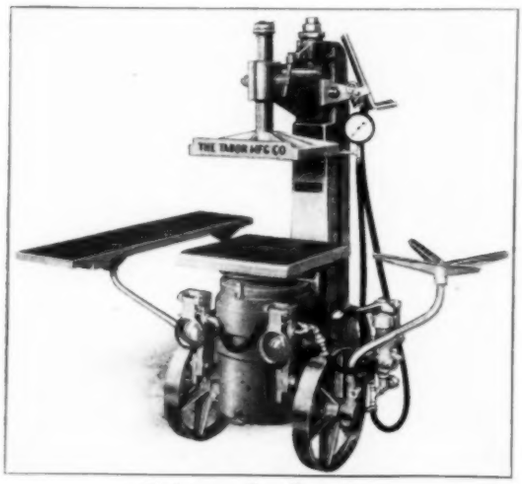


Jar Flask Lift Machine with Adjustable Pins

Jar Squeeze Drop-Plate Machine



Jar Rollover Pattern Draw Machine



Column Jar Squeezer

Since 1884 Tabor Machines have been most important factors in foundry progress. Show us the job . . . We'll show you the machine

GAD: AC—Bench-type Chopper Adjustable Table

MOLDING MACHINES

CUPOLAS LADLES

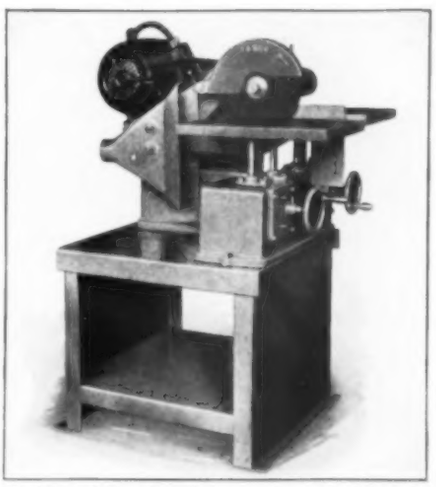
SAND BLASTS TUMBLERS

DUST COLLECTORS

CORE ROOM EQUIPMENT

BRASS FOUNDERS' EQUIPMENT

ABRASIVE CUT-OFF MACHINES



GAD: AS—Stationary Bench Type Adjustable Table

TABOR MANUFACTURING COMPANY
TRADE 1884 MARK
6225 Tacony Street, Philadelphia, Pa.

Foreign Representatives:

Australia and New Zealand: Norman N. Benson, 532 Kent St., Sydney, Aus.
Continental Europe: Giesserei-und Werkzeugmachinen; G. M. B. H., Frankfurt a. M, Hochst, Schliessfach, Germany.

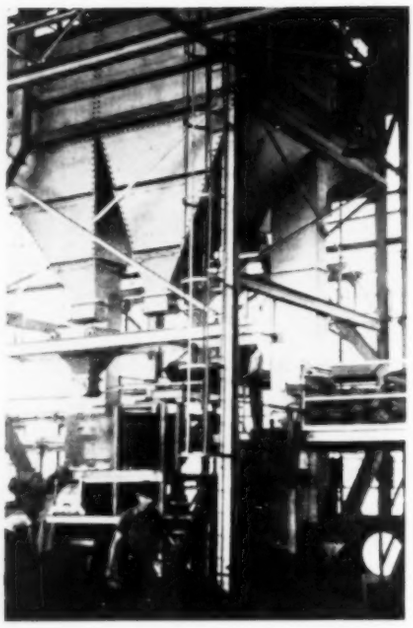


Fig. 10—Overhead hoppers supply molding and core sands to individual mixers

Molding Magnesium Alloys

(*Continued from page* 20)

ing about 45 minutes, then reduced to 1550-1600 degrees for a short interval before pouring. Once molten, the metal in the pots must be kept covered to prevent burning at the surface. Covering material is a special granular compound, white in color, supplied by Dow Chemical Co. It is shoveled into the open pots at intervals or whenever the metal starts to oxidize, readily detected by the characteristic brilliant blue-white flame of burning magnesium.

When the metal is ready to be poured, the pot is transferred to a ladle shank, handled by two men, and carried to a waiting mold. At this point, granular calcium is sprinkled on the top of the molten metal as a further precaution against oxidation. The calcium burns slowly, and thus protects the magnesium beneath. Just before the ladle is tipped for pouring, the flux on top of the bath is skimmed back and a mixture of boric acid and sulphur is dusted over the pouring box. As the metal comes up in the risers, this powder is dusted over the exposed surface. As the metal streams from the ladle, it appears a glistening, rusty red in color. No time is lost in the pouring operation, and generous amounts of the oxidation inhibitor are sprinkled over the metal constantly. A steel wool strainer is placed in the pouring box and serves to hold back any pieces of flux which inadvertently get by the lip of the pot.

Castings are shaken out 15-30 minutes after pouring, depending upon size, and are then dispatched to the cleaning department. Here the first operation is a thorough sand-blasting in a booth made by the W. W. Sly Co., Cleveland. Gates and risers are then sawed off on bandsaws, after which portable grinders give the surface an initial smoothing. These grinders are operated in conjunction with water wash dust collection booths where all grinding dust is entrapped. The castings then go to benches where pneumatic chisels, grinders and other portable equipment give a final touching up to the surface. Many magnesium castings, especially those for aircraft parts, must be kept within fairly close tolerances, 0.030-inch for example, and consequently a rather extensive amount of hand cleaning and finishing operations is necessary.

Castings Are Heat Treated

Optimum physical properties call for a special heat treat operation and a low-temperature aging. These are known technically as solution and precipitation heat treatments, respectively. Solution heat treatment, at 730 degrees Fahr. for 10-12 hours and air cool, increases tensile strength, elongation and impact toughness. The precipitation treatment or aging, at 375 degrees, increases yield strength with some sacrifice of elongation and toughness.

For all heat treatments, a circular electrically heated furnace made by the General Electric Co., Schenectady, N. Y., is provided, with capacity of 1500 pounds of castings. The furnace is sealed from the outside atmosphere, with a fan located in the base for circulating the furnace atmosphere which is largely sulphur dioxide, obtained by burning sulphur in the furnace.

Following careful inspection, castings are given an anticorrosive treatment known as a chrome pickle. This is nothing more than a quick dip (about 10 seconds) in a hot solution of sodium bichromate, concentrated nitric acid and water, in the ratio of 1.5 pounds of bichromate, 1 pint of acid and water to make 1 gallon. This produces an iridescent, yellow-red coating on the surface which is intimately bonded to the metal, provides a good base for subsequent painting, and has definite anticorrosive properties.

Sea Air Causes Pitting

In localities away from sea coasts, magnesium alloys have good resistance to corrosion, but are subject to pitting or roughening in salt atmospheres. All castings made by Magnesium Fabricators are given the bichromate treatment as added precaution against corrosion.

Special pains are taken in the cleaning department to guard against accidents which might result from accumulated dust on floors, machines and clothing. Workmen must wear fireproof coats, goggles and gloves, with no wool clothing permitted. At intervals they must blow their clothing free from dust with an air hose. Meanwhile, floors and equipment are swept regularly to remove particles of magnesium dust. No effort is made to reclaim either sweepings or particles exhausted from the dust collection booths, the small amounts of metal available not being worth the cost of reclamation.

So far, all castings produced have been of an alloy known as X-7, although there are a number of other

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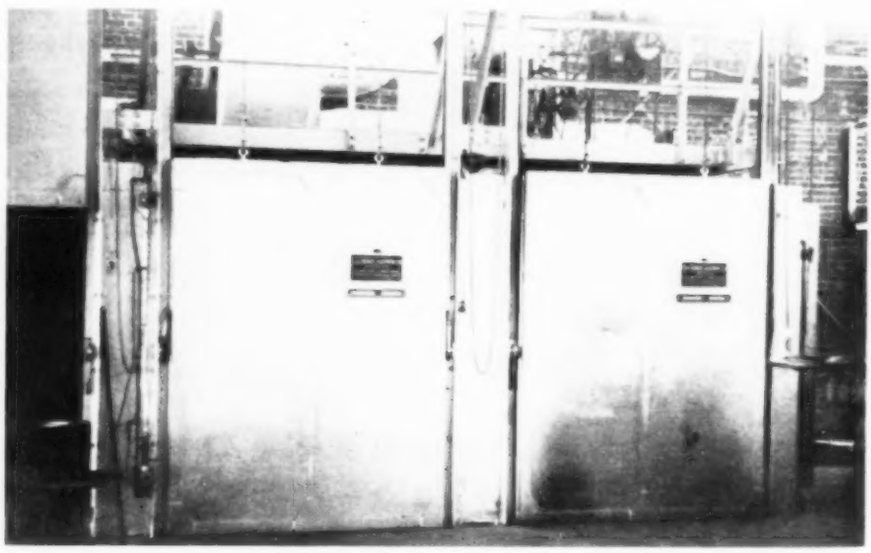


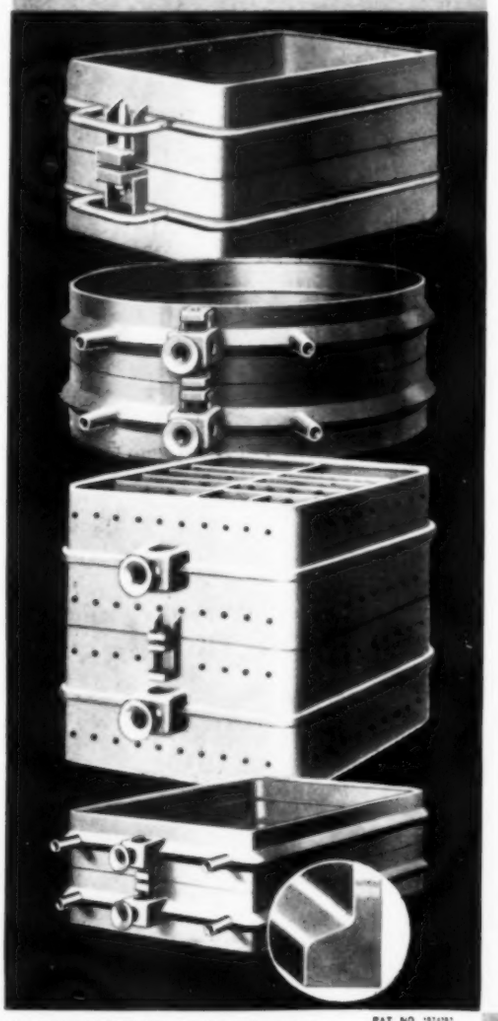
Fig. 11—Standard core racks are accommodated in gas-fired core ovens for overnight baking

6 SAVINGS!

You get an even half-dozen profit-boosting economies where you modernize your foundry with Sterling Rolled Steel Flasks. These six important savings add up to better work, increased production and decreased costs.

Constructed of high-carbon, copper bearing steel, Sterling Flasks stand up under the roughest usage, yet are easy to handle. There are sizes, styles, and shapes to meet every molding requirement,—bench, floor, or machine. Sterling Flasks have solid center ribs.

Modernize NOW—install Sterling Flasks.



PAT. NO. 1974292

STERLING FLASKS
Have Solid Center Ribs

1 SAVING TIME

2 SAVING MAN-ENERGY

3 SAVING LABOR COSTS

4 SAVING CASTINGS

5 SAVING FLOOR SPACE

6 SAVING SAND

STERLING WHEELBARROW COMPANY
7100 W. WALKER STREET • MILWAUKEE, WISCONSIN

Physical Properties of Magnesium Castings

	As Cast	Solution Heat Treatment	Precipitation Heat Treatment
Tensile strength, pounds per square inch	24-28,000	30-36,000	32-37,000
Yield strength, pounds per square inch	10-12,000	10-13,000	16-19,000
Elongation, per cent in 2 inches	4-7	6-12	2.5-5
Brinell hardness (500/10/30)	48-50	50-52	65-71
Fatigue endurance limit pounds per square inch			

(*Concluded from page* 56)

alloys in the so-called Magalloy series, the proprietary name applied to products of the Bohn division. X-7 analyzes 6 per cent aluminum, 3 per cent zinc, 0.15 per cent manganese and the remainder magnesium. The metal is supplied in pigs by the Dow Chemical Co., and no alloying is necessary in the melting operations.

As far as applications are concerned, there are many fields yet to be explored, but a few parts already produced in sand castings in quantities include supercharger housings weighing about 33 pounds for Pratt & Whitney aircraft engines; accessory cases for airplane engines, carrying fuel pump and other devices; supercharger impeller for Allison airplane engine; transmission cases for buses; tire carriers for buses; numerous types of power tool cases; cutter bars for lawnmowers; matchplates, patterns, flasks and core boxes for foundry use; tractor parts; engine oil pans, and others. Large magnesium alloy castings made in this plant include a special aircraft casting scaling 60 pounds, and another weighing 72 pounds for Steel Products Engineering Co.

This light metal is claimed to offer special advantages in most all average instances where fair strength combined with exceptional lightness is a prime consideration.

Trade Associations Are Considered

"Sales and Profits and Trade Associations" is the title of a 10-page booklet prepared by Tuscany, Turner & Associates, trade association organization and management, 1213 West Third street, Cleveland. Designed to provide an insight to benefits to be derived through trade association activities, the publication contains discussions on sales volume, co-operative sales promotion, prices and profits, unfair trade practices, organization, industry education, the go-between business and government, and selecting the association executive. Appended are brief lists of major trade association activities, text books, etc.

Adventures of Bill

(*Concluded from page* 53)

was invented, until he met Marie Alexeis Baron, an employe in one of the government offices and then he retired promptly from circulation.

"The party of the first part had no English, while the party of the second part had no French, unless one is inclined to accept the atrociously pronounced smattering picked up in one or two school semesters. Despite this apparent handicap they arrived at such a perfectly mutual understanding that the lady promised to come to America as soon as her suitor was re-established upon his return. In 1920 he was and she did and they were married in Chattanooga. Just like that. He threw his French book in the fire and she learned English so fast and so thoroughly that when she returned to France a few years later on a friendly visit, she found a marked reduction in the speed with which she manipulated her native tongue."

"Seems to me before you wandered off on the moonlight and roses trail you mentioned something about sand," I said.

"Sand? Ah, yes. Sand. So I was. Just the old romantic streak breaking out.

"After the lady had a good working grip on the language and customs of our great and glorious republic her husband staked her to a few thousand dollars to invest in a sand property with another party. The arrangement was not so hot so she bought out the partner and engaged a manager to operate the pits while she attended to financial details and the development of a customer list. During a vacation in Florida her husband wired her IF YOU EXPECT TO SAVE SAND COMPANY BETTER COME HOME AN OPERATE IT.

"She burned up the roads on her way back, burned the pants (Figuratively of course) off the lad in charge and generally made the fur and feathers fly in one grand house cleaning operation. Then she arranged a new setup which for several years has been running like a $40 watch. She visits the plant frequently to see that it is hitting on all 16 cylinders, but most of her time is spent in selling the product, either in the various foundries, or from her office in Chattanooga. She is not Madamoiselle from Armentieres, but she is one of the real prizes the A. E. F. brought back from La Belle Fraunce!"

Fig. 12—General view of foundry floor with coremaking stations in central background, mixers at right

Book Review

The new 1939 *Great Lakes Red Book* including pertinent information on 1500 vessels of all types plying the Great Lakes and listing the owner, company manager and chief engineer of each vessel, recently has been published by the Penton Publishing Co., Penton building, Cleveland.

American Engineering Co., Philadelphia, manufacturers of monorail electric hoists, appointed A. C. Cooper Sales Co., 220 East Forty-second street, New York, as sales representative for metropolitan New York, Long Island, and northern New Jersey. Julian Florandin now is associated with the company.

ADVERTISING PAGES REMOVED

Another view of exhibits displayed by various manufacturers

A.S.T.M. Holds Meeting

(*Continued from page* 21)

dent. G. E. F. Lundell, chief, chemistry division, national bureau of standards, Washington, is the new vice president for 2 years. Newly elected members of the executive committee for 2 years are: J. J. Allen, chief chemist, mechanical rubber goods division, Firestone Tire & Rubber Co., Akron, O.; R. D. Bonney, assistant manager of manufacturing, Congoleum - Nairn Inc., Kearny, N. J.; T. S. Fuller, engineer of materials, Schenectady works laboratory, General Electric Co., Schenectady, N. Y.; J. L. McCloud, metallurgical chemist, Ford Motor Co., Dearborn, Mich.; and M. A. Swayze, director of research, Lone Star Cement Corp., Hudson, N. Y. Continuing as a vice president of the society is W. M. Barr, chief chemist and metallurgical engineer, Union Pacific railroad, Omaha, Neb.

Forty-third annual meeting of the society will be held in Atlantic City, June 24-28, 1940, it was announced. Next regional meeting and spring group committee meetings will be in Detroit, March 4-8, 1940.

Report of committee E-9 on research reviewed the work of various committees which come under its observation, including the research committee on fatigue of metals; joint research committee on effect of temperature on properties of metals of the American Society of Mechanical Engineers and A.S.T.M.; joint committee on exposure tests of plating on nonferrous metals, composed of representatives of the American Electro-Platers' society, National bureau of standards and A.S.T.M.; and effect of speed of testing on physical properties of metals.

New research activities undertaken during the past year include committee investigation on chilled and white iron castings. This committee's report was presented by its chairman, T. S. Fuller, engineer of materials, works laboratory, General Electric Co., Schenectady, N. Y.

Tests High Strength Iron

Presentation of four technical papers and four committee reports featured the meeting on iron under the chairmanship of J. J. Shuman, Jones & Laughlin Steel Corp., Pittsburgh. The first technical paper "Mechanical Properties of High Strength Cast Iron" by Jasper O. Draffin and W. L. Collins, University of Illinois, Urbana, Ill., was presented by Mr. Collins. The paper gives results of tests on a high strength cast iron which parallel closely similar tests on low strength iron presented before the society during the past 2 years.

Among conclusions reached by the authors are the following: In tension and torsion, high strength cast iron is quite similar in general action to low strength cast iron; modulus of elasticity of the high strength iron is nearly the same in compression and bending and slightly less in tension; modulus of elasticity in shear is about four-tenths the value in tension and compression; modulus of rupture in bending is less for H-sections than for solid rectangular sections; and in a beam the neutral surface rises as the load is increased, the rise being greater in an H-beam than in a rectangular beam.

The second paper, "Influence of Chromium on the Oxidation Resistance of Cast Iron", by C. O. Burgess, Union Carbide & Carbon Research Laoratories, Niagara Falls, N. Y., presented results of an investigation to determine effect of various chromium contents on resistance oxidation of cast iron. Eleven cast irons containing approximately 0 to 25 per cent chromium were employed and during 360 hour exposure periods were heated and cooled from test temperatures of 700, 800, 900 and 1000 degrees Cent. The data indicate the percentage of chromium necessary at each temperature level to limit the total oxidation of cast iron. Low carbon control specimens indicate that carbon content has relatively little effect on oxidation resistance.

Experiment with Drill Tests

The third paper "Resistance of High Silicon Malleable Iron to Drilling," by H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, and R. C. Kaser and N. E. Mertz, Case School of Aplied Science, Cleveland, was presented by C. H. Junge of the National company. In a drilling test of malleable cast iron ranging from 2.09 to 2.36 per cent carbon and from 1.39 to 2.10 per cent silicon, it was found both elements reduce resistance to drilling.

The last paper, "Relation of carbon Nodule Size and Tensile Properties of Malleable Cast Iron" by Dr. Schwartz of the National company and H. J. Schinder and J. F. Elliott, of Case school, also was presented by Mr. Junge. In the test a given white cast iron was converted into malleable irons varying widely in nodule number. The test indicated a great variation in nodule number has little effect on the tensile strength and yield strength but that a small nodule number is favorable to ductility.

Report of committee A-3 on cast iron, presented by Willard H. Rother, Buffalo Foundry & Machine Co., Buffalo, recommended the withdrawal of standard specifications for the arbitration test bar and tension test specimen for cast iron (A120-29). Revised specifications for cast iron soil pipe and fittings will be presented to the society for action later in the year.

Report of committee A-7 on malleable iron castings, presented by E. K. Smith, Electro Metallurgical Co., Detroit, provided new tentative specifications for pearlitic malleable iron castings. The report also recom-

mended that tentative specifications for cupola malleable iron (A197-36) be adopted as standard and that standard specifications for malleable iron castings be continued without revision.

T. H. Wiggin, consulting engineer, New York, presented the report of sectional committee A 21 on specifications for cast iron pipe and special castings. The speaker stated specifications for pit cast pipe and for mortar for pipe linings have been completed and other work is under way. This work is a project of the American Standards association.

Report of the research committee on fatigue of metals, presented at the session on fatigue and corrosion by H. F. Moore, professor of engineering materials, University of Illinois, Urbana, Ill., and committee chairman, reported progress on the investigation of the effect of type of testing machine on fatigue test results. Some delay has been experienced in getting a supply of uniform material for the tests.

The corrosion portion of the session included a recommended revision in the standard methods of determining weight and uniformity of coating on zinc coated (galvanized) iron or steel articles (A 90-33). This revision omits from the methods all reference to the Preece test as more up-to-date information has been incorporated in the methods of test for uniformity of coating by the Preece test (copper sulfate dip) on zinc-coated (galvanized) iron or steel wire (A 191-38) and on steel castings and forgings, gray iron and malleable iron castings (A 208-38 T).

The fourteenth Marburg lecture of the American Society for Testing Materials, entitled "Stress, Strain and Structural Damage" was presented Wednesday afternoon by Herbert F. Moore, professor of engineering materials, University of Illinois, Urbana, Ill., and past president and honorary member of the society. In introducing his talk, Professor Moore pointed out that in planning the shape and size of structural and machine members so that they will function without mechanical failure, the designer has to consider the problem of materials from several viewpoints.

States the Viewpoints

They include the following: What are the magnitudes, directions and length of time and frequency of application of the loads which the part must carry, and how long a life must the part have for satisfactory service; what are the intensities of internal force or stresses, the deformation or strains and the energy represented by the stress-strain relation which must be resisted without injury; and what are the significant resisting properties of various available materials for the part and what is their quantitative value.

Professor Moore devoted the greater portion of his discussion to the consideration of the following four types of structural damage: Elastic deformation; damage caused by inelastic action, fracture, and damage by continuing deformation or creep. This was followed by a discussion of a few of the common tests used to determine resistance to structural damage in materials of construction.

In conclusion, Professor Moore stated "The days of Galileo and his simple assumptions of absolute rigidity, uniform stress, and fracture as the only criterion of structural damage seems delightfully simple, and we sometimes envy him in his ability to develop a satisfactory analysis for the needs of his day without having to worry about elastic strength, fatigue of metals, creep, wear or corrosion. However, we have one consolation. There is no present indication that the knowledge of materials will become so complete that we will lose our jobs for want of work to do, nor that the A.S.T.M. will pass out of existence for the same reason."

Receives Medal Award

Following the address, the Charles B. Dudley medal of the society was presented to Dr. Roy W. Carlson, associate professor of civil engineering, Massachusetts Institute of Technology, Cambridge, Mass., for his paper "Drying Shrinkage of Concrete as Affected by Many Factors" which was presented before the 1938 meeting of the society.

Report of committee E-4 on metallography, presented at the metallography, magnetic testing, and radiography session by L. L. Wyman, General Electric Co., Schenectady, N. Y., and chairman of the committee, recommended a new tentative method of preparation of metallographic specimens.

H. H. Lester, Watertown Arsenal, Watertown, Mass., and chairman of committee E-7, on radiographic testing, presented the Committee report which offered a recommended practice for the radiographic testing of castings, and a tentative standard for radiographic examination of castings.

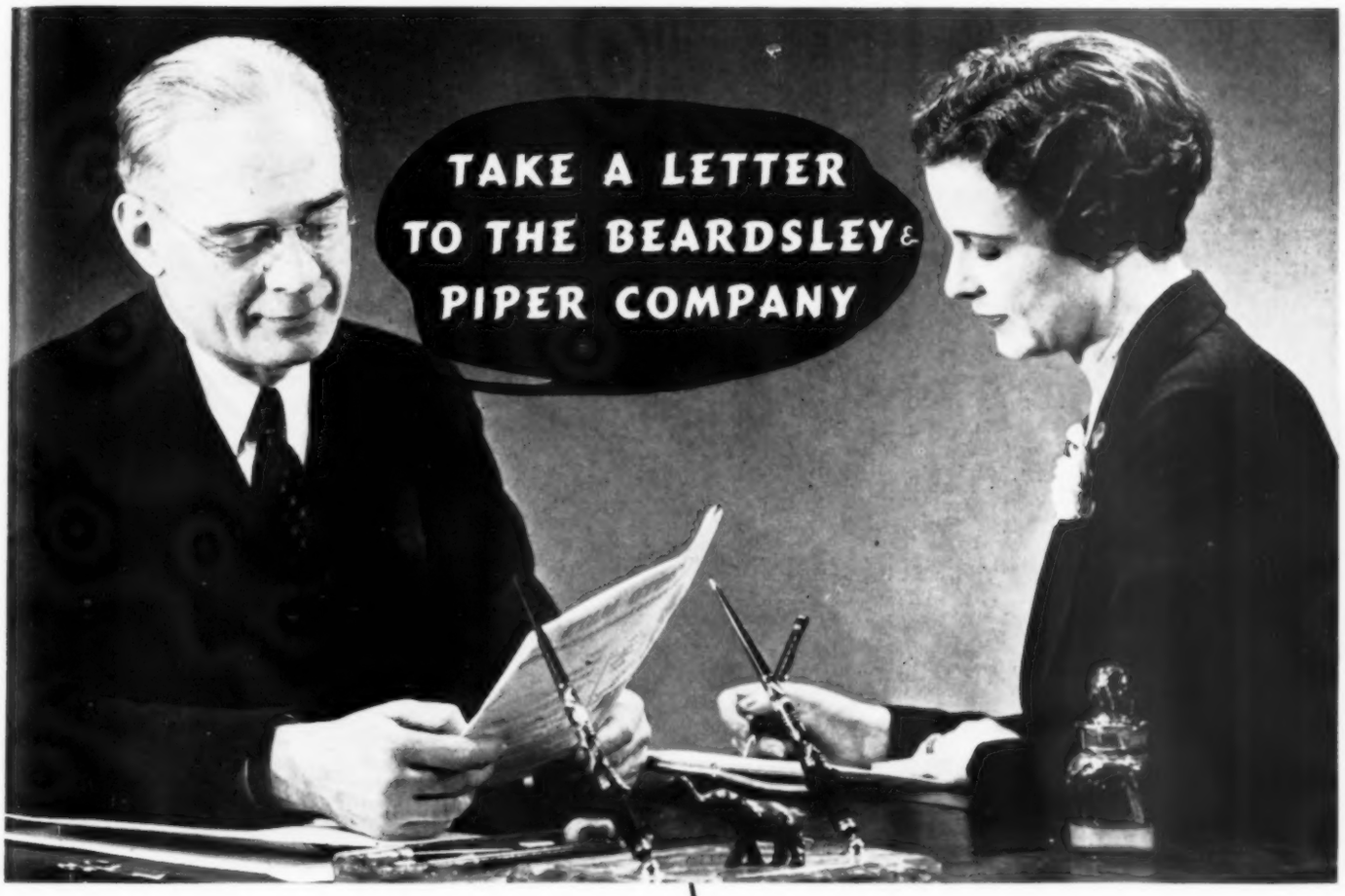
At the radiography session, the first paper "Use of Radiography in Development of Castings for Mass Production," by Don M. McCutcheon, Ford Motor Co., Dearborn, Mich., was presented by J. L. McCloud, Ford Motor Co. The author stated that the number of cast parts being used in the modern automobile constantly is increasing. For example, in the month of February, the Ford Motor Co. used 7000 tons of copper-silicon steel castings alone.

(*Continued on page* 64)

Graduates Foundry Apprentices

SECOND annual graduation exercises of apprentices of the Farrel-Birmingham Co., Ansonia, Conn., was held June 12. *Diplomas were presented to fourteen* 1939 *graduates, while seven* 1938 *graduates received special recognition and were given official diplomas. The exercises were opened with an address of welcome by Roland G. Hartwell, apprentice supervisor. An American flag for use in the classroom then was presented in behalf of the apprentices by George Crook Jr., one of the graduates. Following the presentation, Albert S. Redway, vice president took charge and greetings were extended to the graduate apprentices by Nelson W. Pickering, president. C. Arthur DuBois, executive secretary of training committee, Scoville Mfg. Co., Waterbury, Conn., was the principal speaker. This was followed by the presentation of official diplomas and the joint International Correspondence schools' certificates.*

Seven machinists, one patternmaker, five foundry and one welding apprentice received diplomas while five machinists, one patternmaker and one foundryman received 1938 *diplomas.*



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(*Continued from page 62*)

In replacing other types of fabrication with castings, a manufacturing advantage must be shown, and the casting must possess the necessary strength and other physical properties. In the development work, radiographic examination is used with pilot castings to determine the most economical foundry procedure that will produce sound castings. The author then described the procedure followed in making the radiographic examinations. He also pointed out that radiographic examination is not used in regular inspection of castings.

An interesting study that may point to future trends was presented in a paper "Correlation of Some Mechanical Tests of Aluminum Alloys with X-Ray Tests" by Tom A Triplett, Triplett & Barton, Burbank, Calif., and W. Lavern Howland, California Institute of Technology, Pasadena, Calif. Both cast and forged materials were studied to find the difference in mechanical properties with what was called radiographic quality. The results show that certain correlation was obtained between nondestructive X-ray tests and destructive mechanical tests. Material judged good or poor from radiographic tests, when compared by dynamic tests, showed a greater difference than when compared by static tests.

H. H. Lester, Watertown Arsenal, Watertown, Mass., presented a comprehensive discussion on "Some Aspects of Radiographic Sensitivity in Testing with X-Rays." Dr. Lester cited considerable work on the subject of sensitivity. The final discussion of the session, "Fine Focus Radiography-Gamma Rays" was by Prof. G. E. Doan and Milton B. Vordahl, Lehigh university, Bethlehem, Pa. The paper presented the results of attempts to determine how narrow an internal crack in a metal object can be revealed reliably when a radiant source of very small diameter is used. Using a radiant bulb approximately 1/16-inch in diameter, cracks 0.001-inch wide in blocks of steel 1-inch thick gave distinct registry. In 2-inch, 3-inch, and 4-inch blocks the limits of crack width were 0.002-inch, 0.003-inch and 0.003 to 0.004-inch respectively. Cracks of that fineness would probably escape detection with sources of the usual dimensions.

Reporting for committee A-1, its chairman, N. L. Mochel, metallurgical engineer, Westinghouse Electric & Mfg. Co., Philadelphia, recommended several proposed specifications for acceptance as tentative—including: Carbon steel castings for miscellaneous industrial uses suitable for fusion welding; carbon steel castings suitable for fusion welding for service at temperatures up to 850 degrees Fahr.; and alloy steel castings suitable for fusion welding for service at temperatures from 750 to 1100 degrees Fahr. It was recommended that the tentative standard for carbon steel castings for miscellaneous industrial uses (A 27-36T) be adopted as standard.

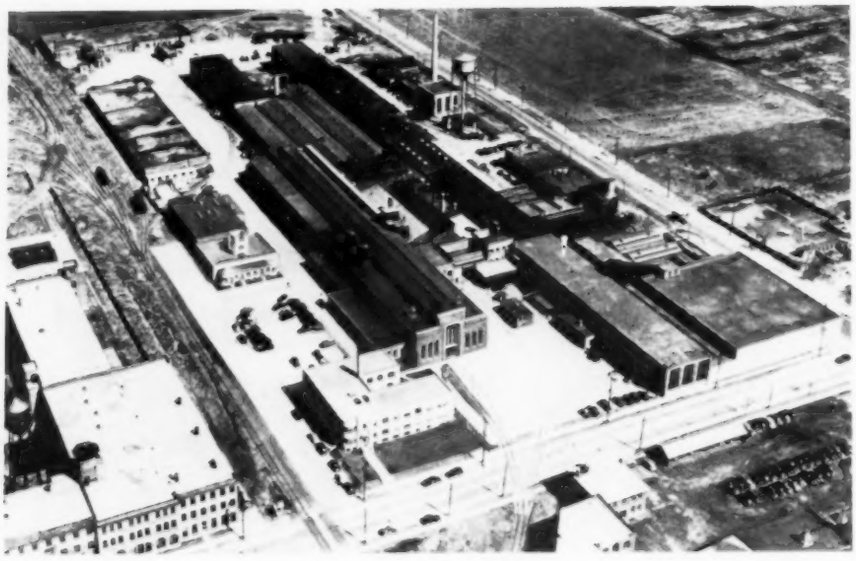
Committee A-9 on ferroalloys, recommended for adoption and advancement to standard of revised specifications covering ferrotungsten, ferromolybdenum, molybdenum salts and compounds, ferromanganese, ferrovanadium, ferrosilicon. It further recommended that revisions proposed in the standards for spiegeleisen and ferrochromium be accepted for publication as tentative.

Subcommittee 1 reported progress on preparation of standards for ferroboron, ferrotitanium and silicomanganese. Being considered is preparation of a standard for molybdenum compounds other than calcium molybdate. While the latter has been the chief medium of molybdenum additions, new developments in use of molybdenum briquets and molybdenum oxides as addition agents already has caused a shift of calcium molybdate from first to third place in volume.

History, selection and utilization of the Alloy Casting Research institute test block for heat-resisting alloys were covered in a paper presented by O. E. Harder, assistant director, Battelle Memorial institute, Columbus, O. In this paper, Dr. Harder reviewed an earlier survey conducted by the institute to determine the opinion of foundries and testing laboratories regarding the most suitable type of test specimens for use with heat-resisting alloys in determining high-temperature ten-

(*Concluded on page 66*)

Steel Foundry Builds Plant Additions



SIX additions and a new administrative building were included in a recent improvement program of the American Manganese Steel division of the American Brake Shoe & Foundry Co., at the main plant, Chicago Heights Ill. The new administration 2-story building 94 x 105 feet houses the executive offices, accounting and engineering departments, drafting and blue print rooms, sales, advertising, research and purchasing departments and class rooms for a welding school. Employe's welfare building, two stories, 55 x 88 feet, has locker accommodation for 450 employes in five specially ventilated locker rooms equipped with foot controlled wash fountains, drying cabinets for clothing and shower baths. Lunch room and first aid room are in the basement.

An addition 80 x 120 feet to the west foundry is lighted by steel sash windows with semiobscure glazing. Ventilators are motor driven. Roof is fire proof. This addition houses all foundry raw materials. A structure 25 x 115 feet houses the laboratory and the melting department offices. A two story addition 127 x 152 feet reinforced brick and concrete houses the pattern storage. A one story addition 30 x 165 feet joins the pattern storage and the foundry and is used for flask storage and pattern layout. An addition to the machine shop increases the floor space by 4000 square feet. The shipping room has been enlarged by an addition 50 x 200 feet with increased facilities for truck and car loading. A new building 48 x 50 feet houses two 200 horsepower boilers for shop heating. This building also houses compressors, water treatment equipment and the master mechanic's office. B. F. Olson, Chicago was architect for the foundry extension, welfare and office buildings.

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ABRASIVE PRODUCTS

FOR ACCURACY AND ECONOMY IN MANUFACTURE

(*Concluded from page* 64)
sile properties and creep characteristics. He also reported some experiments on use of a pot-type of casting.

Further work at Battelle developed a wedge-shaped test block with a riser along the entire length but gated only at the bottom. The A.C.R.I. technical committee suggested modifying the block so as to introduce hot metal into the head or riser. The A.C.R.I. then proceeded to an evaluation of various kinds of test blocks, including end-headed round, A.S.T.M. B-4 block, keel block, star-gate, U-bar, side-head block and the wedge shape. These various blocks were compared with reference to ease of casting, soundness of specimens, mechanical properties, and relative amount of metal to be melted to produce a given number of specimens.

Dr. Harder reported that the wedge-shaped block which would produce four tension test specimens was adopted on the basis of these requirements. Detailed in the paper was utilization of this block in testing three types of heat-resisting alloys which usually are designated as NC-4, CN-36 and NC-2, or 35 Ni-15 Cr, 25 Cr-12 Ni, 60 Ni-12 Cr.

Present Tentative Specifications

An extensive discussion of data on nonferrous metals was presented Friday afternoon with G.E.F. Lundell, National bureau of standards, Washington and J. R. Townsend, Bell Telephone Laboratories, New York, as chairmen.

New tentative specifications proposed by committee B-5 include the following: Leaded nickel brass and leaded nickel bronze ingot for sand castings; and tentative classification of cast copper-base alloys. Numerous revisions to standards and tentative standards also were proposed. The report included a paper "Nomenclature and Classification of Cast Copper and Copper-Base Alloys" by Sam Tour, Lucius Pitkin Inc., New York. The paper outlines the confused situation in the classification of nonferrous alloys, and discusses the work done to provide the classification of foundry alloys presented in the tentative classification by the committee. The classification includes in the term *copper* all alloys containing 98 per cent or more copper, in the term *brass* all copper-base alloys containing an appreciable amount of zinc, and in the term *bronze* all copper-base alloys containing alloying elements other than zinc and in sufficient amounts to be predominant over zinc in the alloy.

Report of committee B-6 included a paper "Magnesium Alloy Die Castings," by A. W. Winston, Dow Chemical Co., Midland, Mich. The author pointed out that while magnesium alloy die castings have been produced in this country since 1931, considerable trouble was encountered with the goose-neck machines used. Operation problems largely were eliminated by the introduction of cold chamber machines in which the metal is ladled by hand and the shot made at a pressure up to 4000 pounds per square inch.

Metal is melted in a separate furnace protected from oxidation by sulphur vapors. Metal pouring temperature is from 1175 to 1250 degrees Fahr., the die temperatures running from 250 to 500 degrees Fahr. Castings up to more than 200 square inches in projected area and up to 74 inches in length have been made. Several alloys are available but most are made from A.S.T.M. alloy No. 13. The author then discussed the properties and applications of magnesium die castings.

Report of committee B-7 on cast and wrought light metals and alloys submitted tentative specifications for aluminum base alloys in ingot form for die castings; aluminum alloy ingots for remelting; and aluminum for use in iron and steel manufacture. Revisions were recommended in tentative specifications for aluminum alloy (duralumin) sheet and plate; aluminum alloy (duralumin) bars, rods and shapes; magnesium base alloy ingot for remelting; and aluminum-magnesium-chromium alloy sheet and plate.

German Foundrymen Meet in Berlin

Under the chairmanship of Director Dipl.-Ing. W. Bannenberg, Velbert, the Verein deutscher Giessereifachleute (German Foundrymen's association) held its twenty-eighth annual convention in Berlin on June 2 to 4. On the morning of the first day, the members visited the plant of the Mitteldeutschen Stahl and Walzwerke in Brandenburg. The first technical session, held that afternoon, was opened by Director J. Petin, Kassel, who spoke on "Foundry Technique for Cast Iron in Theory and Practice." He was followed by Oberingenieur Dr.-Ing. H. Jungbluth, Essen, who discussed "Gray Iron Standards of Foreign Lands." The third speaker at the session was Director Dr.-Ing. H. Resow, Magdeburg, who described "Strength Values Demanded by the Designer and Those Which Are Found in Steel Castings." Final paper in the session was presented by Dr.-Ing. Theodore Geilenkirchen, Dusseldorf, on "Modern Cleaning Apparatus in Service for Silicosis Prevention."

On the second day the morning session was opened by Prof. Dr.-Ing. H. Uhlitzsch, Freiberg, who spoke on "Charges for Alloy Cast Iron with Practical Calculations." The second speaker was Oberingenieur Dr.-Ing., Theodore Klingenstein, Stuttgart, who discussed "Electric Furnace and Material Economy in the Gray Iron Foundry from the Particular Viewpoint of the Requirements of the Four-Year Plan." Third paper of the session was presented by Dr.-Ing. F. Schulte, Remscheid, and dealt with "Properties and Applications of Acid Resisting Chromium and Chromium Nickel Steel Castings." Final paper on the morning program was by A. Klemenz, Leipzig, on "Present Day Lessons of Plant Economy."

That afternoon the chair was occupied by Prof. H. Nipper, Berlin, and the first paper was that by Dr.-Ing. A. Burkhardt, Berlin, on "The Development of Zinc Alloys Since 1900." The second paper by Dipl.-Ing. G. Guertler, Berlin, described "Effect of Various Additions Upon the Crystallization of Eutectic Aluminum-Silicon-Alloys." Third paper of the session by Dr.-Ing. P. Kaja, Essen, was on "Critical Comments on Casting Tests and Delivery Instructions of M. E.-Metal Castings." Final paper of the session by Dipl.-Ing. P. Chretien, Aachen, described "Determination of Hydrogen in Aluminum and Silumin Castings."

Final session of the meeting was held on the morning of the third day, and was opened with an address by the chairman of the German Foundrymen's association, Director Dipl.-Ing. W. Bannenberg. He was followed by Prof. Dr.-Ing. M. Paschke, Clausthal, who spoke on "Vanadium—A German Metal." Third speaker on the program was Prof. W. Guertler, Berlin, who discussed "Our Metallic Materials—Present Day Status of the German Exchange Plan." Final paper on the program was by W. Daitz, Berlin, on "German Political Economy in Reconstructed Europe."

Method of Analysis

Bureau of mines, Washington, recently has published technical paper No. 8, entitled "Methods of Analyzing Coal and Coke," by F. M. Stanton, A. C. Fieldner, and W. A. Selvig. This paper is a revision of one previously published in 1929, and in addition gives methods for determination of sulphur forms and of carbon dioxide in coal. Copies of the paper may be obtained from the superintendent of documents, Washington, for 15 cents each.

Detroit sales branch of United States Rubber Co. has moved to 5850 Cass avenue.

ADVERTISING PAGES REMOVED

Group on the terrace of Windsor palace, photo courtesy Dr. A. B. Everest

I.B.F. Acts as Host

(*Continued from page* 24)

practical application of their researches and discoveries.

He mentioned these words from Leonardo da Vinci: "Remember that each proposition must possess basic utility in order that such knowledge may not be useless." He also referred to the practical and humanitarian results of the scientific work of the late Guglielmo Marconi.

He stressed the importance of cooperative work, and said that periodical meetings such as the present one helped to avoid duplication of work and waste of effort due to exaggerated individualism. Knowledge, and the results of each individual work, should be shared. He ended by saying: "These periodical meetings, and the friendly ties and mutual respect derived from them, serve, more than anything else, the cause of progress and universal peace. There can be no diffidence, hostility or jealousy in our field of action, where theory has to illuminate practice and where both aim at making man more firmly master of the laws of nature and of his possibilities of dominating these laws and subject them to his will. On the other hand, a common pride and joy unites us today, as in the past, in the knowledge that we are at the head of that movement which leaves nothing to chance that is connected with human work, which wants everything done according to the law of the minimum effort with the maximum of results, so that industry will be able to supply the increasingly complex needs of human society. We trust that God will assist the men who are devoting themselves to this immense task in order to give industry, and thus to all mankind, an era of prosperity, of stability, of peace."

The Lord Mayor of London then proceeded to the distribution of awards made by the institute. He presented the Oliver Stubbs gold medal to J. G. Pearce, director of the British Cast Iron Research association. The institute's meritorious services medal was awarded to J. E. Cooke, who until recently had been secretary of the Lancashire branch of the institute over a period of years and who is still carrying on a great deal of work on behalf of that branch.

American Receives Medal

Then the Lord Mayor presented the E. J. Fox gold medal to Dr. H. A. Schwartz. That medal is awarded annually to a person of any nationality who is distinguished in foundry practice and science and in metallurgy, and Dr. Schwartz is the first one outside of Britain to receive the medal. In presenting it, the Lord Mayor said that the award was made to one who was esteemed throughout the world for his scientific work in the development of malleable cast iron. Dr. Schwartz, who received the medal in person, expressed his thanks, and mentioned that Prof. T. Turner was the first European to receive an A.F.A. medal.

J. Hepworth, then invested W. B. Lake with the chain of office, stating that no man was more worthy to take charge of the destinies of the institute. President Lake took the chair and proposed that a message of greeting and loyalty be sent to their Majesties the King and Queen. The proposal was unanimously acclaimed by the meeting. The president extended a hearty welcome to all overseas delegates, expressing the hope that all would work together for peace and for the benefit of humanity. He then delivered his presidential address.

This address had for its subject a most interesting and comprehensive review of the history of steel castings, steel castings having been one of the major interests of the president's career. Castings of steel were made in Great Britain as far back as 1609 by the cementation process, but it was not until 1740 that their manufacture became commercially possible by means of the crucible furnace. The first successful manufacturers of crucible steel in the United States were the brothers Garrard, who established themselves in business at Cincinnati in 1831. In Germany, steel rolls using cast iron molds were the first steel castings to be made by Friedrich Krupp, of Essen, in 1832. The first steel castings in the United States were made by the William Butcher Steel Works, now the Midvale company, in the late 60's.

Reviews Steel Industry

In 1904, Mr. Lake and Mr. (now Sir) Valentine Crittall investigated a particular crucible process on the continent, which yielded *mild* steel castings: Mr. Lake entered into an agreement with the Monkemoeller concern of Bonn, Germany, and started a foundry at Braintree, Essex, for the production of castings by that process in 1906.

The president reviewed the various developments in the manufacture of steel castings, giving some interesting side-lights on the origin of the American iron foundry industry, and mentioning the inventions and work of Bessemer in 1858, Robert in 1884, Tropenas in 1889. Some historical points were made regarding the origin of the Siemens-Martin process, which, through the collaboration of Dr. C. W. Siemens with Emile and Pierre Martin, achieved real success in 1864. The process was introduced into America in 1868, at the works of the New Jersey Steel & Iron Co., Trenton, N. J.

Passing on to electric furnaces, Mr. Lake mentioned the Kjellin furnace, tried out in Sheffield about 1908, and the Heroult and the Stobie designs, introduced in Sheffield in 1911, but these plants were not installed for the purpose of making steel castings, and historians credit Mr. Lake's company with the distinction of being the first foundry in the United Kingdom to install an electric furnace for the sole purpose of making steel castings, in 1910. On the continent, Heroult furnaces had already been used for steel castings, in Germany in 1908, and in Italy in the foundry of the late Carlo Vanzetti. Electric steel castings started to be made in America about the same year as the electric furnace was started at Braintree. George Fischer estab-

lished the first Heroult-type furnace in Switzerland in 1907. V. C. Faulkner installed the first electric furnace in Spain, at Bilbao, in 1917.

High-frequency furnaces now are used for manufacturing steel castings, and one was installed at the president's works in 1928 to make magnetic letters, which are so small that in some cases as many as a score are required to weigh 1 ounce.

Finally, mention was made of pulverized fuel-fired rotary furnaces, of the Sesci and Brackelsberg type. Reference was also made to the invention of manganese steel by Sir Robert Hadfield. In the conclusion of his address, the president emphasized that developments in steel foundry practice resulted from the work of scientists and practicians from many industrial countries, and it was appropriate, at such an international meeting, that the author was able to mention the names of outstanding men who were, and several of them still are, citizens of various nations represented at the congress.

Studies Atomic Structure

The morning's proceedings ended with the presentation of the Fourth Edward Williams Lecture: "The Atomic Pattern of Metals", by Prof. W. L. Bragg, Nobel Laureate, director, Cavendish laboratory, University of Cambridge. Professor Bragg has devoted many years to the study of the atomic structure of metals, and exposed this highly intricate subject in simple language, illustrating his points by means of clever and witty comparisons.

In his lecture, Professor Bragg had mentioned the occurrence of weak links in certain atomic chains in the structure of metals. In his conclusion he drew attention to weak links in the chain between science and industry: On the one hand, many scientists still keep aloof from the practical side of their studies, and on the other hand, industrialists are not sufficiently prone to understand the scientist's language or to share the scientist's viewpoint sympathetically. All efforts should be made on both sides to make stronger the bond and the understanding between them.

After the luncheon interval the congress resumed for the discussion of technical papers. The meeting of the International Committee on Testing Cast Iron was also held, with its president, J. E. Hurst, past-president of the institute, in the chair, supported by Prof. Albert Portevin, honorary president of the committee. Technical organizations from 13 countries, including the United States, were represented.

On the evening of the Tuesday, a reception by His Majesty's government was held at Lancaster house, the Rt. Hon. the Lord Runciman, Lord President of the council, and Lady Runciman acting as hosts. Lancaster house, as well as being the venue for government receptions, is a museum of outstanding interest, containing numberless relics relating mainly to the history of British sovereigns and of the City of London.

The morning of Wednesday, June 14, was devoted to the discussion of more papers, which were divided into two separate sessions, one for special cast irons and one for nonferrous metals.

In the afternoon, members of the Congress had the choice of a variety

Mr. and Mrs. John Cameron, photo courtesy Dr. A. B. Everest

of works visits, including: J. & E. Hall, Ltd., Dartford, makers of refrigerating apparatus and escalators; Ealing Park Foundry, Ltd., South Ealing, general ironfounders using the meehanite process; Sterling Mfg. Co., Ltd., Cubitt Town, makers of domestic laundry equipment, with a vitreous enamelling shop; R. & A. Main, Ltd., Upper Edmonton, gas cooker manufacturers, with vitreous enamelling shop; Gillett & Johnston, Ltd., Croydon, bell founders; Glacier Metal Co., Ltd., Wembley, general mechanized nonferrous founders.

The principal social event of the congress, the banquet, which assembled about 550 guests, was held that evening. The guests were received by President W. B. Lake and Mrs. Lake, supported by Dr. Guido Vanzetti, president of the International committee, and Signora Vanzetti. The guest of honor was the Rt. Hon. Oliver Stanley, president of the board of trade. In the surroundings of the big Dorchester dining room, the banquet was acknowledged to be the most brilliant of such functions in the history of the institute.

In proposing the toast of "The Foundry Industry and the Institute of British Foundrymen", the president of the board of trade referred to the troubled times through which ordinary people are now living, and expressed the thought that a good deal too much attention is paid to the differences between nations, and only too little to the common grounds between them. One such common ground is the desire to improve the standard of life of the people, and to try to harness all the developments of science and the modern world to the amenities and the necessities of the common people. He said that one attraction of the foundry industry must be the fact that so large a portion of it, even in these days, is devoted to the needs of peace.

Promote Peace Between Nations

He emphasized the importance of research work, in which the Institute of British Foundrymen plays such a great part. He paid tribute to the co-operation that exists between foreign countries, as illustrated by the congress, a co-operation that extended to the exchange of knowledge of human beings, and said that to understand each other was to take the first and perhaps the longest step to peace.

In his reply, President Lake briefly reviewed the work of the institute since it was established 35 years ago. He referred to the previous international congress held in London in 1929 under the presidency of Wesley Lambert, and he expressed the pleasure of British foundrymen to be able now to reciprocate the hospitality which many of them have enjoyed during their visits to the foundrymen of other countries.

Barrington Hooper, president of the London branch of the institute, proposed the toast of "The Ladies, Guests and Overseas Visitors", and Dr. Guido Vanzetti, president of the International committee, responded, and in so doing expressed the hope that as many as possible of those present would be able to attend next year's congress in Milano and Rome.

Works visits were the order of the day on Thursday, June 15: these were mostly whole-day visits, there being a choice of three: the works of the Ford Motor Co., Ltd., Dagenham; Crane, Ltd., and E. R. & F. Turner, Ltd., Ipswich; or Bagshawe & Co., Ltd., Dunstable. For the visit to Ford's, the journey was made by steamer, down the River Thames, passing through the various docks of the Port of London. Lunch was offered by the Ford Motor Co. The visit to Ipswich was made by train.

(Continued on page 72)

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(*Continued from page 70*)

and lunch was offered by the Crane Co. The visit to Bagshawe's was done by motor-coach, and while the male members of the party visited the works, which specialize in castings for and the assembling of conveyor plant and equipment, the ladies visited a hat factory in the neighboring town of Luton. Both parties then joined for lunch by invitation of the Bagshawe company, and the members afterwards visited the famous Whipsnade Zoo on the Dunstable downs.

Half-day visits were also arranged, one in the morning to the works of Belling & Co., Ltd., Enfield, electric heater and cooker manufacturers, with a vitreous enamelling plant, and one in the afternoon to the National Physical laboratory, Teddington, one of the leading scientific laboratories in Europe.

In the evening of the Thursday, all visitors to the congress were entertained at the Dorchester hotel by President and Mrs. W. B. Lake, the entertainment taking the form of a dance interspersed with the Dorchester cabaret show.

The whole day on Friday was given to the presentation of technical papers, two sessions being held in the morning, one on cast iron and the other on alloys. The afternoon session was held jointly with the Iron & Steel institute and was devoted to papers on steel castings. That meeting forged a new link in the happy relationship between the two institutes.

The meeting of the International Committee of Foundry Technical associations was also held on the Friday morning, with President Guido Vanzetti in the chair, the American Foundrymen's association being represented by Dr. H. A. Schwartz and past-president W. R. Bean, supported by Vincent Delport, European representative. The calendar of forthcoming international congresses was adopted as follows: 1940, Italy; 1941, Holland; 1942, United States. The election of officers for the year 1940 resulted in a unanimous vote in favor of J. Lobstein, president of the Association Technique de Fonderie of France, as president. The meeting then elected Hungary to nominate the vice-president. After the meeting, the official delegates laid a wreath on the tomb of the Unknown Warrior in Westminster Abbey. They were then entertained to luncheon by President and Signora Guido Vanzetti.

The whole day on Saturday was given up to a pleasant trip to Windsor castle, where the Royal family spend some of their time during the summer months. Visits were made to St. George chapel, the Chapel of the Knights of the Garter, the old castle and the state apartments. Then followed a most enjoyable trip by steamer on the River Thames, this being the occasion for friendly farewells between those who, by force of circumstances, were returning home and those who were leaving on the next day for the post-congress tour.

Visitors Go on Tour

During the whole week in London a varied program was arranged for the entertainment of the ladies who, in large numbers, had accompanied their husbands to the congress.

Those members who took part in the post-congress tour left London on Sunday morning, June 18. The tour started with a visit through the Shakespeare country, visitors arriving in Birmingham in the evening.

In and around Birmingham visits were organized at the works of the Austin Motor Co. Ltd., the automobile manufacturers; W. & T. Avery Ltd., manufacturers of weighing and testing machines; and the Mid land Electric Mfg. Co. Ltd., makers of electrical switchgear.

At Derby, on the Tuesday afternoon and Wednesday morning, the works visits included: Ley's Malleable Castings Ltd., the largest malleable iron foundry in Europe; Rolls Royce Ltd.; Qualcast Ltd., who specialize in quantity production of gray iron castings for electrical and automobile industries, and are the largest manufacturers of lawnmowers in Europe; the Stanton Ironworks Co. Ltd.; Bamford's Ltd., manufacturers of agricultural machinery and makers of oil and petrol engines; International Combustion Ltd., makers of power house and boiler house equipment.

Thursday, June 22, was spent in Sheffield, when the steel foundries of Firth-Vickers Ltd., Hadfield's Ltd., the English Steel Corporation Ltd., were visited, together with the foundry of Davy & United Engineering Co. Ltd., manufacturers of steelworks plant.

See the Lake District

On Friday and Saturday morning, the following works were visited in Manchester and its vicinity: Metropolitan-Vickers Electrical Tool Co. Ltd.; Craven Bros. Ltd., manufacturers of heavy machine tools; Mather & Platt Ltd., manufacturers of textile machinery and of fire protection appliances.

On Sunday, June 25, members were afforded an opportunity to relax by going through the Lake district, which, within an area of 100 square miles, gives the visitor a unique variety of landscape, with mountains and lakes, each having its individual character. Members arrived at Glasgow on the Sunday evening, and on the Monday enjoyed a cruise along the Firth of Clyde, famed for its landscape and for the numerous shipyards erected on each side of the river for some distance from Glasgow.

On the Tuesday, works visits in the Glasgow region included: Babcock & Wilcox Ltd., makers of boiler plant; Harland & Wolff Ltd., marine engineers, who built the engines for the QUEEN MARY and QUEEN ELIZABETH; The Carron company, one of the oldest foundries in the world, who specialize in light castings; G. & J. Weir Ltd., manufacturers of marine auxiliary machinery; Glenfield & Kennedy Ltd., hydraulic engineers; and the Singer Manufacturing Co. Ltd., makers of sewing machines.

Wednesday, June 28, was spent in Scotland's ancient capital, Edinburgh, famous for its beauty, historical associations, its castle and its war memorial. The members followed on to Newcastle, where they visited the works of Sir W. G. Armstrong Whitworth & Co. (Iron founders) Ltd., who make general castings for the shipbuilding industries, rolls and refined iron; the

(*Concluded on page 74*)

Another view of the group on the visit to Windsor, photo courtesy Dr. A. B. Everest

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(*Concluded from page 72*)

Northeastern Marine Engineering Co. Ltd., ship-propelling machinery specialists; a modern coke-oven plant at the Priestman Collieries Co. Ltd., a modern coal mine at Wallsend & Hepburn Coal Co. Ltd., and the works of C. A. Parsons & Co. Ltd., specialists in turbine sets and turbo-electric generators.

The return journey to London on the Friday afternoon, June 30, by the famous Coronation train concluded a most enjoyable and instructive tour throughout England and Scotland.

Thirty-eight papers, covering practically every subject connected with the casting of metals, were presented at the congress. Nine of these papers were official exchange papers presented by the technical associations of Belgium, Czechia, France, Germany, Holland, Hungary, Italy, Poland, and the United States. The exchange paper presented on behalf of the American Foundrymen's association was by Frederick A. Melmoth, Detroit Steel Casting Co., Detroit, on "Renaissance of the Steel Casting and the Role of the Metallurgist." The paper has been presented in the July and August issues of THE FOUNDRY. Abstracts of other papers will be presented in an early issue.

One paper was specially contributed by the South African branch of the Institute of British Foundrymen and dealt with "Industrial Legislation in South Africa," the author being A. H. Guy, Eclipse Tube Mill Liners (Proprietary) Ltd., Benoni, Transvaal, president of the South African branch. The British Cast Iron Research and the British Non-Ferrous Metals Research associations also contributed papers.

Division To Discuss Refractories

Refractories division of the American Ceramic society will hold its Fall meeting Sept. 8 and 9 at the Oakland Beach hotel, Conneaut Lake, Pa. Committee C-8 of the American Society for Testing Materials will hold a meeting at the same place on Sept. 7. The program of the division meeting will cover chiefly special refractories. The Friday morning session has for its general topic "Special Refractories in the Nonferrous Industry." The session on Saturday morning will deal with "Special Refractories in the Steel Industry."

Hartley-Rose Belting Co., Pittsburgh, has been made a factory branch by T. B. Wood's Sons Co., Chambersburg, Pa., serving the greater Pittsburgh industrial area.

Parker Again Heads Malleable Group

Frank O. Parker, sales manager, Acme Steel & Malleable Iron Works, Buffalo, was re-elected president of the Malleable Founders society at the annual meeting held at the Westchester Country club, Rye, N. Y., June 23 and 24. John A. Wagner, president, Wagner Malleable Iron Co., Decatur, Ill., was re-elected vice president and Robert E. Belt again was made secretary-treasurer.

The new board of directors, named at recent sectional meetings and organized at the annual meeting, is as follows: C. L. Carter, president and general manager, Albion Malleable Iron Co., Albion, Mich.; Charles A. Gutenkunst Jr., president, Milwaukee Malleable & Gray Iron Co., Milwaukee; W. V. Tiscornia, vice president, Auto Specialties Mfg. Co., St. Joseph, Mich.; John A. Wagner, president, Wagner Malleable Iron Co., Decatur, Ill., Anthony Haswell, vice president, Dayton Malleable Iron Co., Dayton, O.; Arthur F. Jackson, vice president and general manager, Michigan Malleable Iron Co., Detroit; H. A. Marti, secretary-treasurer and general manager, Maumee Malleable Iron Co., Toledo, O.; C. H. McCrea, works manager, National Malleable & Steel Castings Co., Cleveland; H. Nelson Albright, manager, Columbia Malleable Castings Corp., Columbia, Pa.; L. A. Dibble, president, Eastern Malleable Iron Co., Naugatuck, Conn.; Frank O. Parker, sales manager, Acme Steel Malleable Iron Works, Buffalo; and F. C. Tuttle Jr., manager, Belcher Malleable Iron Co., Easton, Mass.

The subject of market development featured the two sessions that were held. On Friday morning, Stanley A. Knisely, director of advertising, Republic Steel Corp., Cleveland, presented a most interesting discussion of "Co-operative Industrial Sales Promotion." Mr. Knisely indicated that the basis of such a program must consist of co-operative scientific research to improve the product and methods of production; co-operative marketing research; and co-operative study of new uses. With such work under way, the industry is ready to undertake co-operative sales promotion.

Mr. Knisely warned against permitting the product of an industry to go out of style. Unless the customer is familiar with the advancements of the industry, he may believe that competing products are more in style. Any co-operative sales promotion program, according to Mr. Knisely, should consist of the following five steps: Introduce the industry and the product; gain an acceptance of the product; gain a preference for the product; fit the product to the prospect's needs; and get the order. The first three are accomplished through co-operative publicity and advertising programs and the last two by salesmen of the individual companies. Co-operative sales promotion in Mr. Knisely's opinion, is creative, and need not in any way interfere with the programs of individual companies. Such co-operative effort should simplify and strengthen the work of member companies.

Discuss Publicity Methods

At the second session, E. E. Griest, Fort Pitt Malleable Iron Co., Pittsburgh, and chairman of the committee on publicity and market development, reported on the work that has been undertaken by his group. Mr. Griest discussed several instances where proper market development work should result in the further use of large tonnages of malleable iron castings. Following Mr. Griest, James L. Cawthon Jr., development engineer of the society, discussed the market development and publicity program of the society. He distributed and discussed the first of a series of folders produced by the society entitled "Malleable Iron Facts," and nine engineering data file sheets, each illustrating and describing specific applications of malleable iron castings.

On Saturday morning, Prof. Enrique Touceda, consulting engineer for the society, discussed several studies now being made, including the action of 0.25 per cent lead on the structure and machinability of malleable iron; the effect of 0.15 and 0.18 per cent phosphorus on malleable iron when subjected to subzero temperatures; and the specific values of the various tensile properties of malleable iron. Preliminary studies indicate 0.25 per cent lead tends to produce a pearlitic structure. The tensile tests deal with the measurement of elongation of various materials at maximum load and at failure, with further study to be made.

On Friday morning, James H. Lansing, shop practice engineer of the society presented the interesting results of a survey on molding sand. Mr. Lansing also mentioned briefly the course for operating men held at Rensselaer Polytechnic Institute, Troy, N. Y. The remainder of the program was devoted to reports of the various committees of the society.

Thomas Truck & Caster Co., Keokuk, Iowa, recently purchased the business of the William H. Sippel Corp., South Bend, Ind., manufacturer of truck casters, industrial trailers and skid platforms. Manufacturing operations will be combined at Keokuk.

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Nonferrous Alloys Available

(*Continued from page* 25)

physical characteristics of the variations of the red brass alloys *A* to *D*, inclusive, all of which are more or less variations of the standard 85-5-5-5 ounce metal, or composition brass. These are shown on pages 33 and 76 of the January issue. It will be noted that the ultimate tensile strength, for example, varies from 30,000 pounds per square inch, the low figure in the case of composition *B*, to 45,000 pounds per square inch, the high figure in composition *D*. The low tensile strength is the lowest result obtained with about 5 per cent tin, and the highest is the high figure frequently reached for the composition having the high figure of 6½ per cent tin, indicating that the copper-tin ratio is an important factor to bear in mind when that characteristic of red brass alloys is of first importance.

Composition Affects Hardness

Brinell hardness does not vary a great deal. Of course, in the case of composition *C*, the figure for brinell hardness of 50 is the maximum shown in composition. It is well known that the hardness of the series of alloys runs from 45 to 55 normally under commercial conditions. In the case of the series *E* to *L*, inclusive, also a series of red brasses, but in which the lead or zinc or both have been increased so that the similarity to the standard 85-5-5-5 alloy is no longer noticeable, several interesting effects upon the physical properties by the changes in composition are shown.

That series, normally a leaded red brass type, is somewhat lower on the average in ultimate tensile strength. Of course, that is to be expected by the increase in the lead content in some instances. The brinell hardness is somewhat higher as a result of the increase in zinc content, and in one instance the physical properties are affected materially by the presence of 0.5 per cent nickel. This is composition *G*, which, although it only has 2½ per cent tin, the usual hardening element, it does have 10 per cent lead and 10 per cent zinc and exhibits an increase in hardening over the average brinell hardness for the previous series of red brasses of the 85-5-5-5 type.

That series is used more commonly in cheap bearing service, although it hardly would be expected to give a very satisfactory life since the tin content is so low as to preclude the presence of the copper-tin delta or hard bearing crystal to be present for maximum service. Some of the alloys are used in valves and fittings with great satisfaction. Notably composition *H*, which is used regularly in the production of a vast quantity of radiator valves. For builders hardware these alloys also are satisfactory. They polish well and are plated readily to give ornamental finishes for a wide variety of different types of decorative effects.

Series *M* to *P*, inclusive, essentially yellow brasses, exhibit physical properties that are peculiar to the yellow alloys, unless they are hardened by additional elements other than the normal, strictly yellow brass compositions. Tensile strength is not high, in fact it is similar to that of the leaded red brasses. Elongation under stress is even less than that of the average for the red brasses and the brinell hardness usually is quite a little less.

Good Enough for the Service

These alloys are designed largely for their color and cheapness and are used in just such types of service as where cheapness counts first, and where physical properties possible for these cheap alloys are good enough for the service. Gas cocks, cheap ornamental work to be plated or to be polished to match the yellow color of wrought or extruded material from the rolling mills, are typical samples of applications.

Series *Q*, *R* and *S* being special purpose yellow brasses, published data has not been available to compare their physical properties with those of the more common variety. Series *T* to *AA* inclusive are more or less yellow brasses with some additions of tin and lead or both so as to affect the physical properties for the production of definite characteristics necessary for specific service. It will be noted that the tensile strength has been improved in almost every instance. This is to be expected, since the hardening element, tin, has been added to the composition but not in sufficient quantities to increase brittleness as indicated by the fact that the elongation for this series is much the same as that of the series *M* to *P*.

Brinell hardness has been affected materially in this series and consequently the type of alloy is finding favor in services to which the series *M* to *P* are not so well adapted. Yet this series is of a yellow brass color and has many of the yellow brass characteristics. It machines a little more readily than series *M* to *P* since the lead content tends to improve the machinability.

Series *BB* to *DD*, inclusive, are manganese bronzes. The name is in reality a misnomer since these compositions are yellow brasses plus iron, manganese and aluminum, which three elements in their proper proportions affect the physical characteristics in a marked degree. It is because of the marked improvement in ultimate tensile strength and other characteristics in the series that they have become almost universally known as bronze in spite of the fact that the composition, copper and tin, is bronze, and copper and zinc forms brass. In this instance, the copper-zinc very much outweighs the copper-tin part of the compositions.

We all know of the many years that this question of misnomer has been debated by metallurgists and other members of the nonferrous foundry, but since these compositions are so distinctly different from those normally known as yellow brass, it universally is desired that the name should be something to indicate that marked difference. Consequently, in spite of the efforts on the part of many to discourage the use of the term "bronze," it still persists. The term *high tensile yellow brass* is much more descriptive and should be adopted, if possible, by the trade for the name of this series of compositions.

Properties Show Wide Range

It will be noted that the physical properties of the alloys range within rather wide limits. This is to be expected since the compositions themselves vary within rather wide limits in the precentages of the elements—manganese, iron and aluminum—which are added to the yellow brass copper-zinc alloys to produce the high tensile yellow brass compositions.

In the case of composition *BB*, aluminum is 1.75 per cent and in composition *CC* only 0.50 per cent. In reference to manganese, composition *BB* calls for about 3.75 per cent and composition *CC* only 0.35 per cent. In these compositions the iron and aluminum form a compound and appear in the form of an iron-aluminum crystal. Some of the iron also is combined with the copper under the same circumstances. Some of the aluminum also is combined with copper under certain conditions. All of the different combinations have their effect on the physical properties, thus developing the range exhibited by the table of physical properties for these alloys.

Manganese having such a high affinity for oxygen performs a twofold purpose, the one being to deoxidize and the other to form a definite compound with the other ele-

(*Concluded on page* 79)

(Concluded from page 76)

ments in the composition. Proportion of manganese in the different compositions is based on the findings of research. Thus the different ratios of manganese to copper are the result of experiments, the object being to secure the best proportion for each different composition for the particular purpose. If, for example, in composition *BB* the manganese is raised much above 3.75 per cent, elongation tends to fall off due to the hardening effect and the ultimate tensile strength may in some instances indicate an increase as a result of the hardening, provided, of course, that other conditions are unchanged.

An increase in aluminum may give apparent improvement in some of the physical properties, but may have an adverse effect on others. Therefore, it is advisable in the production of this series of compositions first to consider the purpose for which the composition is to be used and then determine by test the proper ratio of the different elements which develop the most satisfactory physical properties for that purpose. The three compositions listed as *BB*, *CC* and *DD* are typical and show the trend resulting from changes in the ratios of the different elements one to another. However, there are a large number of different compositions known as manganese bronze, or high tensile yellow brass, which are sold regularly and which, if properly made, are capable of giving satisfactory service.

Resist Hydrostatic Pressure

Manganese bronzes exhibit a rather pinkish tint when freshly polished as compared with the true yellow brass which is quite yellowish. However, it takes but a moment to develop a slight tarnish on the high tensile yellow brass series to tint it with a color that gives it the yellow brass appearance, with a hint of pink. The alloys in this series take a beautiful polish and have a definite, close structure that lends itself to the use for water tight castings. If castings are made properly, being fed by adequate risers, and the metal has not been gassed in melting, this series of compositions does resist hydrostatic pressure with a high degree of satisfaction. Due to its high tensile strength it does not require the excessive wall thickness that might be required for materials of lower tensile strength.

In compositions *EE* to *OO*, shown on pages 84 and 86 of the March issue, are a group of copper-tin compositions commonly known as tin-bronzes, but some of these have the third element present, such as zinc or nickel or phosphorus. Others not only have a third element permitted but also a fourth, as for instance, *MM* and *NN* in which both zinc and phosphorus are permitted in addition to the straight copper-tin composition. That series illustrates the effect of the addition of tin to copper and the consequent increase in the tensile strength and improvement in the yield point and brinell hardness resulting from tin.

It will be noted that the elongation is affected by the presence of tin. At first, as small percentages are added to the copper the elongation tends to be about that normal to copper itself, but as the tin increases and the hardness becomes greater, elongation falls off. It is a well recognized fact that as the tin increases above about 6½ per cent, the composition becomes one in which there are two types of crystals present when viewed under the microscope, the alpha and the delta.

Tin Goes Into Solution

Below that percentage, under proper conditions all the tin goes into solution and forms a pure alpha solution and there is no hard delta crystal present unless some special circumstance causes some of it to crystalize out. The delta constituent sometimes is known as the hard or bearing crystals since it is harder than alpha and thereby resists wear or abrasion in bearings more effectively. Its presence is to be desired in castings which are to be used under bearing conditions. Some gears have a rubbing effect during operation, thus a bearing metal is to be desired.

Worm gears, for example, operate under this sliding or rubbing action and consequently bearing type crystal is desirable in the structure. This has resulted in the adoption of a copper-tin bronze having a sufficient amount of tin present to develop the two phase alloy in which both alpha and delta crystals are present. Obviously, nuts in which the screw slides around also have this sliding or rubbing effect and a bearing metal frequently will outlast other types of metals for those castings, other conditions being equal. There are, of course, cases where physical properties other than bearing qualities are more important and therefore, some other type of composition must be adopted to meet that particular peculiar condition. Further discussion of the subject will be taken up later.

This is the eighth of a series of articles by Mr. Patch on nonferrous alloys available to the foundryman. Previous articles have appeared in the January, February, March, April, May, June and July issues. Another will appear in the September issue.

THE EDITORS

Chicago Will Hold Fall Regional

A three-day regional foundry conference being arranged by the Chicago chapter of the A. F. A. for the foundrymen of northern and central Illinois, Indiana and southern Wisconsin, will be held Nov. 9 and 10 at the Rosenwald Museum of Science and Industry, Jackson Park, Chicago. The occasion will mark the formal opening of the extensive working foundry exhibit, one of the outstanding exhibits of the many which this world-famous museum will house.

The conference sessions will be so arranged that those attending will have time to view the general exhibits. As the visitor enters through the great bronze doors he will find himself in the great north hall and as he passes under the central dome he will note the inscription on it which summarizes the philosophy of the museum: "Science Discerns the Laws of Nature—Industry Applies Them to the Needs of Man."

Ahead in the South hall is the huge head frame and hoist of the coal mine, the frame of the petroleum drilling rig and related exhibits. Passing through the petroleum exhibits, the visitor next enters the steel room, where among others, is the foundry exhibit. In the East hall, airplanes hang from the ceiling and exhibits on all forms of transportation on land, air and rail can be seen. In the West hall are the exhibits tracing the evolution of power—muscle, water, wind, steam and electricity. In other sections of the museum are exhibits on physics, chemistry, agriculture, forestry, textiles, printing and the graphic arts, the medical sciences, architecture and communication methods.

The foundry exhibit has been developed through the co-operation of a Chicago chapter committee under the chairmanship of C. E. Westover, Burnside Steel Foundry Co.; assisted by W. L. Hartley, Link-Belt Co.; A. C. Christensen, National Engineering Co.; W. R. Bean, Whiting Corp.; H. W. Johnson, Greenlee Foundry Co.; and W. Harvey Payne, Pittsburgh Electromelt Furnace Co. The conference committee is under the chairmanship of L. H. Rudesill, Griffin Wheel Co. Details of the program will be announced at a later date.

Made Representative

Urquhart Service Co., 1501 Wynkoop street, Denver, and 417 Dooley Block, Salt Lake City, Utah, has been made sales representative of the Ajax Flexible Coupling Co., Westfield, N. Y.

Steel Casting Revival

(*Continued from page 27*)

currence, is of a type calling for large numbers from individual patterns. Many foundries have been erected and equipped to meet this demand, and have evolved production schemes of a remarkably efficient and economic character. It is equally true to say, however, that for each of such specialty foundries there exists quite a number whose general demand is as wide in scope as the average European foundry, and where large numbers from a pattern are no more frequent than in similar foundries in Europe. Problems can be discussed, therefore, on a much more common ground than is often accepted as fact.

Secondly, it is often stated that the hardheaded practicality of the American user of castings results in a demand satisfied by the technical performance of the part in service, and quite disregarding such matters as accuracy of shape and contour and surface appearance.

If this were the case in some earlier period, it is most certainly not a fact today. Accuracy, soundness, and smoothness of finish, with the smallest possible machining allowances, are demanded to a standard in most cases higher than the author experienced in similar work in Europe.

Being Continually Disproved

The third and last misconception is one which is being continually disproved by the adoption of identical methods in all parts of the world, and arises from an opinion that repetition production or mass production, involves some lowering in standards of quality and reliability.

The proof of the fundamentally incorrect nature of this opinion has already been given by the world-wide adoption of the methods previously stated, but, specifically referring to steel castings, it is of value to give in some detail facts in contradiction.

The cost of adequate pattern equipment is of so little significance where very large numbers are to be produced that such patterns are commonly beautifully designed and produced, and are wonders of accuracy and permanence as compared with jobbing patterns. The mold from them is therefore more consistent and accurate. The pattern being made of better materials and more highly finished, the resulting casting benefits also in surface finish.

Pilot castings are made, sometimes many times, and subjected to destructive testing, and in many cases x-ray examination, before final gating and heading methods are decided upon, and the results of this are involved as a permanent part of the pattern equipment, and not left to the operator's variable discretion.

The pattern thus produced is mounted on an expensive accurate machine, and the net result is a casting which—once right—is liable to be permanently so, as many variables in its production have been eliminated.

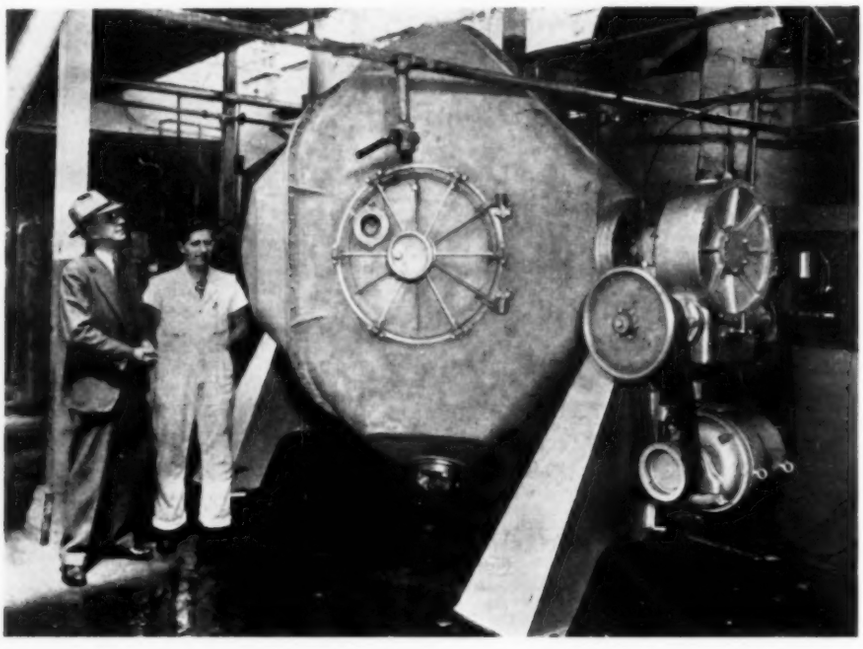
Given the same steel and methods of cleaning and heat treatment, it is logical that one should get a casting of high quality, and what is more important—keep on getting it. Economic exigencies utterly prevent this method of approach to castings produced by older, slower methods, and they frequently represent the final outcome of a gambling hazard, action being controlled by personal opinion, rather than by established fact.

Although not entirely relevant, confirmation of the reliability and the often superior intrinsic qualities of the repetition-produced article is found in what constitutes probably the greatest difference between American and European standards of living; that is, the degree to which advantage is taken of labor performing appliances.

Domestically, practically all forms of household toil are either partially or wholly performed by mechanical appliances, the possibilities of use of which are controlled by, first their price, and, second, their built-in reliability and capability to perform perfectly over long periods of time without any skilled attention. All such articles are repetition produced to fixed high standards, and a period of years observing their almost perfect performance results in one developing a great respect for the products of the repetition production industries. The somewhat opprobrious term, "mass production" should now give way to one much more indicative of what the adop-

(*Continued on page 82*)

Large Churn Made of Aluminum Castings



A LARGE churn, constructed from two sandcast aluminum shells which, together, weigh 1500 pounds, has been built by the Jensen Creamery Machinery Co., Oakland, Calif., and installed in the Challenge Cream & Butter association plant at Oakland. In tests, this unit has churned 660 gallons of cream into 2580 pounds of butter in 30 to 45 minutes. Because of the cubical design, the churn is reported to be capable of churning butter in 50 per cent less time than the conventional roll type units. The huge aluminum castings which make up the body of this new dairy machine were cast at the Los Angeles foundry of the Aluminum Co. of America, and are among the largest aluminum castings ever made. The patterns were so large that special doors had to be built to move them out of the pattern shop into the foundry for casting. Aluminum was used in the construction of this churn to obtain the advantages of the metal's lightness and non-contaminating properties.

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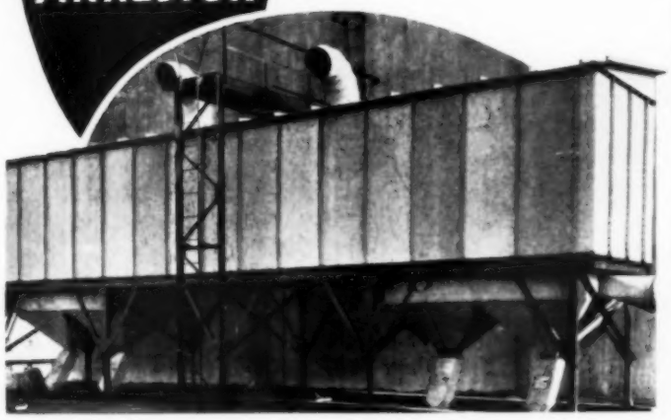
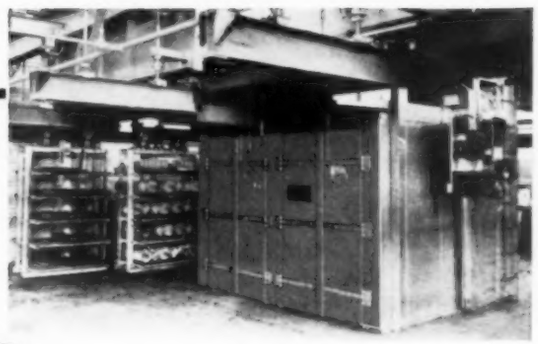
The shape of bag (oval) prevents swirling action as the dust-laden air enters at bottom—eliminating cloth wear . . . And these bags will not plug, assuring maximum efficiency in collecting dust from even the most difficult shakeouts, with lowest back pressure . . . We also build the outstanding WET type dust control system.



PARSONS ENGINEERING CORPORATION
CLEVELAND, OHIO



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Where's that place you filled with SMOOTH-ON ?

THAT'S a common question to the man who did it because only he can tell—you can't, your customer can't.

After a sand or blow hole is filled with Smooth-On No. 4, the surface trued up, and the filling allowed to metallize, even a trained eye and careful search cannot detect the spot.

In spite of all your precautions, some castings will come out of the mold with minor surface defects, which cause no weakness at vital spots but mar appearance. By correcting these blemishes with Smooth-On No. 4, you reclaim an astonishing tonnage, and make savings which should enable you to *safely* quote the successful price in competition.

Once you realize how easy Smooth-On No. 4 is to use and how well it does its work, you will never be without it.

Three grades offer a choice for perfect color, lustre and texture match on any iron or steel casting.

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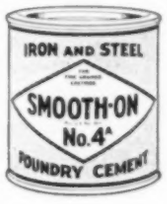
These compositions applied in the usual way meet ordinary needs, but modification of lustre and shade is easily obtained by rubbing the *dry* powder on top of the applied filling. This lightens the shade.



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Do it with **SMOOTH-ON**

(*Continued from page 80*)

tion of such methods indicates, namely, "planned production."

While it is correct to say that the earlier statement regarding the large demand of a jobbing type holds good, yet first and foremost in the minds of American producers is the possibility of planned methods of production. Wherever possible, machinery reduces the physical demand made upon operators, or reduces certain operations to the quantitative accuracy of the machine. It has been said that the main reason for this is the high wage standard of the United States, but close experience suggests the exact opposite: That the high wage standards have grown inevitably out of the practical results achieved by this method of thinking.

The wage standards generally applicable in America are most decidedly not falling, but rather, owing to increased labor organization activity, are still rising. Previous high standards being a direct outcome of logical and economic production methods, and the present tendency further to increase being in no way due to an equally sound fundamental cause, it is easy to see that even greater effort must be made to reduce unproductive effort if much higher prices, likely to create a condition unfavorable to progress and expansion, are to be avoided.

It is almost general that steel foundries are subjecting their equipment to rigorous overhaul, with a view to waste-elimination, and this thought lies behind each method adopted even more prominently than at any previous time. Whether jobbing or repetition in type, the slogan of all American foundries is *control*. Control of cost in all its branches, control of all materials used to tested and approved standards, control of steelmaking methods and molding and coremaking methods, exist in almost all foundries, and as little as possible is left to chance, or to the possibly dubious factor of personal opinion.

This line of thought has led to a great effort on the part of steel founders to encourage research into those factors of steel casting production usually considered as hazardous, or difficult of accurate and quantitative predetermination. It is felt that only when one knows why a happening takes place can plans be devised to control such happening and hit or miss results be avoided.

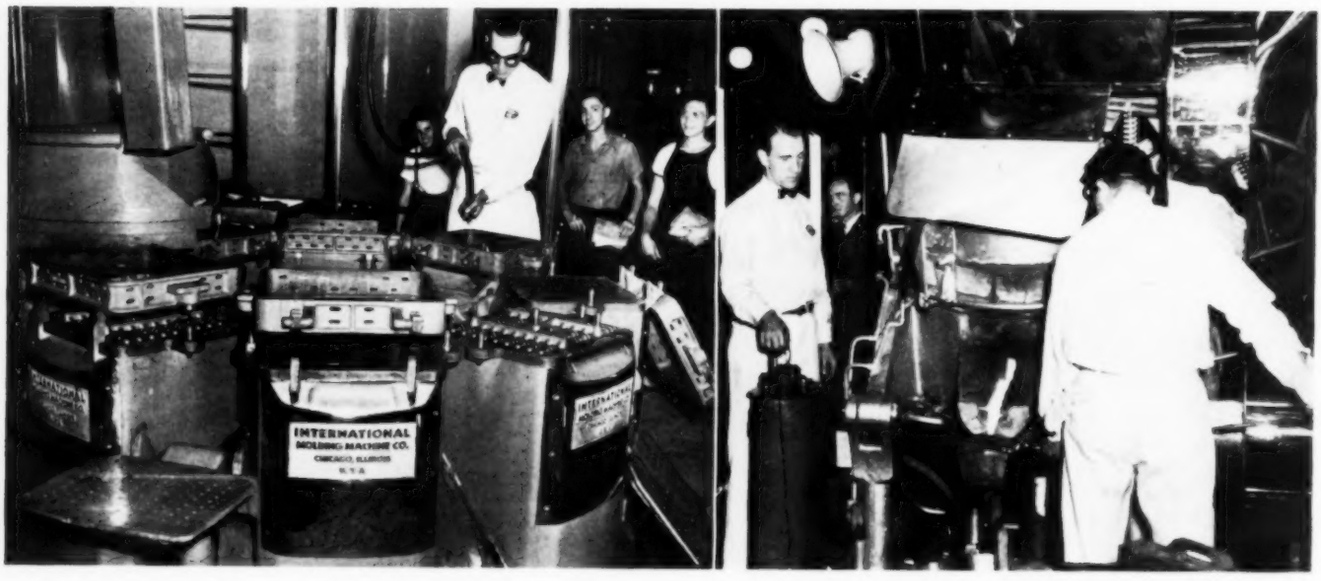
A more careful study is being made of the mechanism of solidification in steel castings, the results of which are evident both in methods of molding and pouring, and in an increased interest in the part played by design. Improved appearance and behavior in service have emphasized to many designers that the requests of the foundry for consideration are much more than mere capricious objections to difficulty, but are based on known fundamentals, and the inherent and unalterable characteristics of liquid to solid phase changes. Methods of molding will keep in line with these logical design changes, so that full advantage can be made available in the final casting of sound and correct solidification.

Mechanically, mold and core production varies little between Europe and America, with the possible exception that in the latter country freer use is made of the machine, and it has long been realized that a molding machine, or any other production machine for that matter, is of little value if one excepts the absolute necessity for auxiliary equipment permitting the easy and uninterrupted flow to and removal from the machine of both the material used and the produced mold. A bibliography of American literature on molding materials and technique for steel casting production is presented on page 86.

At the risk of incurring severe criticism from some quarters, the author considers that the steel founding industry has possessed in a high degree the characteristic of endless experimentation, but almost a complete absence of fundamental research. At the time of his first active connection with the castings branch of the steel trade, very few metallurgists were employed directly by founders. Trained metal-

(*Continued on page 85*)

Ford Operates Iron Foundry at New York Fair



A MOLDING and casting unit, shown in the accompanying illustrations, forms part of the extensive exhibit of the Ford Motor Co., at the present World's fair in New York. The extreme neatness which characterizes every department of the huge River Rouge parent plant is reproduced here and even surpassed to the extent that the operators are dressed in white from top to toe and wear collars and bow ties. The operating unit designed for the production of iron valve guide castings contains a turntable with eight molding machines, four for the copes and four for the drags; a sandslinger, an electric furnace for melting the iron in batches of 250 pounds, and a blasting unit. The foundry unit is operated on a commercial basis in that the castings are shaken out, annealed, cleaned, machined and shipped

(*Continued from page* 82)
lurgists failed to find either attractiveness or promise of advancement in the industry, and it is not unfair to say that the most prominent attitude on the part of executives and supervising foremen toward such men was one of profound skepticism of their ever being of much use in the manufacture of castings. At that time, some 25 years ago, the habit of research and the application of scientific methods of thought were growing rapidly in the major portion of the metal industries, that represented by mechanically worked products.

The illusion of art was preserved by the foundries to the exclusion of the cold-blooded scrutiny of their processes by science, and the inevitable elucidation of many of the fundamentals governing the production of sound castings. A tolerance was shown for the manifested results of scientific research in several production phases more or less common to all branches of the steel trade, such as melting methods and heat treatment, but that intricate composite of contradictions and intelligent guesses, the actual production of the casting itself, was practically sacrosanct: Aloof from the type of thought being given to the forging, the rolled products, and their initial stage, the production of sound ingots.

It is believed a fair statement that the production of sound castings represents a combination of practical and theoretical factors offering really great difficulty and calling for all possible elucidation and understanding, and as a consequence, this attitude toward scientific development has retarded progress to an extent impossible of quantitative estimation. Although conditions are changing, future rapid progress rests upon its complete elimination.

Recognize Steel Castings

The major portion of the role of the metallurgist in the advancement remains to be played, and present indications in the United States and elsewhere are that the degree to which such type of effort is utilized will be largely increased. The growing realization that a steel casting made according to the principles of good metallurgical and engineering design, poured from steel produced by methods controlled to give good casting properties, and given thermal treatment of a regular and understood type, possesses physical properties almost equal to equivalent worked steels, and in certain special applications may even show superior results, is definitely widening the scope of application.

The unrivalled versatility of steel made fully available in cast-to-form condition, and free from irritating defects, represents an engineering material of construction with great application possibilities.

This, then, must be the object of basic research into steel casting manufacture, and it is believed that the engineering industries to whose product steel castings commonly are built, will, over a period of time, absorb and consolidate into design any factual material which is forthcoming as a result.

Points calling for immediate attention include: First, investigation into various portions of the various steelmaking processes and the effect of composition variation on the strength of steels at temperatures just below solidification.

The practical significance of this is the elimination, or marked reduction in frequency of occurrence of hot tears or cracks. Very often, indeed, almost the entire blame for such happenings is placed upon design, and while such an attitude is probably true in a degree, yet it must be realized that no design variations can be expected which can remove from a large part of the product the subjection of the cooling casting to severe strains, at a time when it is physically least able to withstand them.

More Light Needed

It is known that steelmaking method has a marked bearing on this particular trouble. It is not by any means well known why. Fundamental knowledge on this subject absorbed into steelmaking processes, would be of incalculable benefit to steel casting producers.

A second point of vital importance, on which there exists a multitude of opinions, but little scientifically established fact, is related to the behavior of molten steel for mold gases evolved during pouring and therefore practically inevitable. It is known that steel in certain conditions is much more susceptible, even if of identical orthodox analysis. This matter of gas solubility has a great practical bearing on soundness, but the fundamental causes of behavior variations are far from being clear.

Given perfect soundness, the competitive strength of the steel casting in the engineering industry depends on two outstanding features, surface appearance and response to heat treatment. Experimental work is in progress continuously on both in almost all American foundries, and remarkable improvement has been accomplished. There are factors in both, however, which remain to be solved, if the regularity of behavior, which can only come as a result of control of known and understood principles, is to be achieved generally. Rewards of such research will be great, and until such knowledge is available to the industry, it must necessarily work under a handicap.

Inclusion of remarks on design, in an article entitled as this one, will probably provoke the suggestion of irrelevance, but this is precisely why they are so included. The author believes profoundly that the design of castings has too long been purely the business of an engineer, whose mind and imagination quite naturally are concentrated on the engineering significance of his shape and contours, often to the complete exclusion of metallurgical factors. These latter are therefore left to chance, or to the ingenuity of the foundryman in developing ways of countering the natural behavior of solidifying metal, and the devising of expedients to correct the metallurgical anomalies involved in the design.

Casting Design Is Problem

Design of an ingot from which forged or rolled products are destined to be produced is accepted as metallurgical in view of the shape influence on ultimate soundness and usefulness for the intended purpose. The underlying thought is of course control of solidification so that it occurs in an orderly, progressive manner best calculated to produce soundness and homogeneity.

Therefore, the design of a casting to which no later work is applied of a shape-forming type, possesses a definite metallurgical significance. Casting design thus becomes a two-phase problem: Primarily an engineering phase, controlling the matters relevant to general shape, and suitable strength to perform the intended service; secondly, a metallurgical phase, exerting an influence calculated to produce such solidification progression that soundness results naturally and the casting is thus enabled in all parts to exhibit the physical properties of the metal from which it is made.

It has been suggested many times that a designer should be familiar with the main characteristics of the metal from which his design shape will be produced, so that such knowledge on his part has an opportunity of affecting his ultimate decisions, but, so far, no really practical method of achieving this desirable end has been evolved.

It is worthy of note at this time that the two major organizations dealing with castings in America are making serious and organized attempts to remedy this situation. The American Foundrymen's association, by means of regular and frequent special conferences held in the various universities and with the effective co-operation of the faculties, has brought before students opportunities of attending technical dis-

cussions on many foundry subjects, prominent among them being design. The Steel Founders' Society of America, through newly organized divisional operating groups, has formulated committees in each division whose special duties are to co-operate with university and engineering college authorities in the bringing before engineering students of the essentials of casting production and the possibilities of great improvement by the correlation of metallurgical factors and design shape and form. In each case the underlying idea is to ensure actual foundry information being at the disposal of the embryo designer.

The reaction to these movements has been more than merely encouraging, the utmost willingness being evidenced to allow speakers qualified by experience opportunities of stating the case for castings. The ultimate result of these developments cannot be otherwise than beneficial, as more and more practical facts of design effect are made available to the designers of the future.

Formulate Rules of Design

A paper presented to the 1938 A.F.A. convention, by Briggs, Gezelius and Donaldson, is especially worthy of note in this connection, as it represents an unusual effort to evaluate practically many of the metallurgical effects of conventional design. Actual production of a large number of commonly occurring shapes and junctions, and their exhaustive examination by metallurgical methods, which included the x-ray, led the authors to formulate certain rules of design.

It is significant that in all cases these rules, arising from exhaustive testing, parallel almost exactly the recommendations to designers which have been emanating from steel founders for years as a result of their practical experiences. The present author recently stated in an article dealing with casting design that the curse of the steel castings industry was orthodoxy of design, and he has little or no reason to modify that statement as his experience has extended.

Shapes and contours accepted as correct to perform certain services fall definitely into fixed types, many of which became customary when in less developed engineering times gray iron was by far the most commonly used cast material. Changes have usually been in minute detail, minor concessions of local effect, often of value, but not affecting major principles.

It has been truly stated that "Man is a creature of habit," and the design of metal castings is an outstanding example of habit formation. The author can imagine no other single factor in foundry production of such vital effect, nor one which offers greater future possibilities of reward, than the co-operative metallurgical and engineering designing of castings.

Almost everything in the world has been redesigned to meet conditions effectively as they arise, and always in the light of the new knowledge of controlling factors. It is reasonable to suppose, therefore, that ultimately this method of thought will inject itself into the metal casting industries, and when that time arrives there will be entirely new shapes and forms, metallurgically sane, and possessing even greater capacities of engineering performance because of that particular fact.

Future Looks Promising

Economy of production, reduction of manufacturing hazards, the manifestation in all parts of the available properties of the metal used, greater reliability and regularity, and an increasing application—all are possible of achievement in greater degree when known metallurgical fundamentals are permitted to exert their co-operative influence on engineering design demands. A bibliography of American literature on design of steel castings follows with those on heat treatment, and molding materials:

Bibliography of American Literature on The Design of Steel Castings

Economies in Steel Casting Design, by F. A. Lorenz Jr., THE FOUNDRY, October, 1932.

Fillet Profiles for Constant Stress, by Dr. R. V. Band, *Product Engineering*, April, 1934.

How Solidification Affects Steel Casting Design, by F. A. Melmoth, *Product Engineering*, April, 1934.

Steel Casting Design for the Engineer and Foundryman, by C. W. Briggs, R. A. Gezelius and A. R. Donaldson, American Foundrymen's association Preprint No. 38-28, 1938.

Steel Castings Prove Merit as Large Intricate Parts, by F. K. Donaldson, *Machine Design*, June, 1938.

Bibliography of American Literature on Heat Treatment of Steel Castings

Production and Heat treatment of Alloy Steels, by R. A. Bull, *Metals and Alloys*, September, 1931.

New Heat Treatment for Carbon Steel Locomotive Castings, by A. W. Gregg, *The Iron Age*, Feb. 2, 1933.

Heat Treating Steel Castings, by John D. Knox, THE FOUNDRY, February, 1935.

Localized Surface Hardening, by R. L. Rolf, *Steel*, Nov. 30, 1936.

A Continuous Heat Treating Furnace in a Steel Foundry, by John Howe Hall, *The Iron Age*, July 22, 1937.

Report of Steel Division Committee on Heat Treatment of Steel Castings, *Transactions*, A.F.A., August, 1937.

Problems and Practices in the Heat Treatment of Steel Castings, by A. W. Lorenz, *Symposium on Steel Castings*, A.S.T.M. and A.F.A., June, 1932.

Bibliography of American Literature on Molding Materials and Technique for Steel Casting Production

Relation of Molds and Cores to Porosity in Steel Castings, by George Batty, *Transactions*, A.F.A., 1934.

Mechanics of Porosity in Steel Castings, by R. C. Woodward, *Transactions*, A.F.A., 1934.

Function of the Steel Foundry Foreman in Preventing Porosity, by R. A. Bull, *Transactions*, A.F.A., 1934.

Controlled Directional Solidification, by George Batty, *Transactions*, A.F.A., 1934.

Studies on Solidification and Contraction in Steel Castings. Free and Hindered Contraction of Cast Carbon Steel, by Charles W. Briggs and Roy A. Gezelius, *Transactions*, A.F.A., 1934.

Influence of Temperature Gradients in the Production of Steel Castings, George Batty, *Transactions*, 1935.

Expansion and Contraction of Molding Sand at Elevated Temperatures, by T. W. Dietert and F. Valtier, *Transactions*, A.F.A., 1935.

Sand Control in Relation to Steel Foundry Production, by Charles Fuerst, *Transactions*, A.F.A., October, 1937.

A Study of Steel Molding Sands, by H. W. Dietert, E. E. Woodliff and J. A. Schuch, *Transactions*, A.F.A., December, 1938.

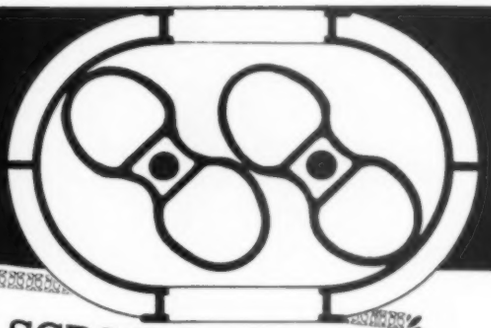
Book Review

The Engineers' Manual, second edition, by Ralph G. Hudson, professor electrical engineering, Massachusetts Institute of Technology; cloth; 340 pages 5 x 7½ inches; published by John Wiley & Sons, Inc., New York and supplied by THE FOUNDRY for $2.75 and in Europe by the Penton Publishing Co. Ltd., London.

The author states that this book originated from the conception that the practicing engineer or engineering student would welcome a consolidation of formulas and constants for which he is accustomed to search through several volumes and that application of each formula might be explained more concisely than in texts devoted exclusively to the process of derivation. Engineering formulas, mathematical operations and tables of constants, which appear to be most useful, are presented in systematic order and in size of book designed to fit the pocket Each formula is preceded by a statement in which its application, the symbology of the involved physical quantities and definite units of measurement are indicated.

Sequence of the formulas is based generally upon their order of derivation so that the understanding of a formula may be enlarged by inspection of the formulas which precede it. During the several printings of the first edition substantial improvements were made in all parts of the book. In this second edition the entire chapter on heat and a large part of the chapter on electricity have been rewritten and brought up to date. This edition also contains revisions and extensions of all tables of physical constants, new steam tables, recomputations of all conversion factors affected by the latest definition of the B.t.u., an enlarged table of conversion factors and many other additions.

BLOWER DIVIDENDS *for foundrymen*



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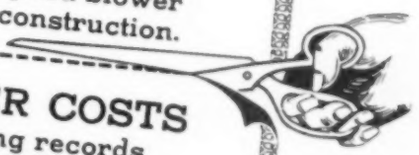

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(*Concluded from page* 28)

delivery of clean iron. A casting with even a minute imperfection is scrapped by the inspectors.

Grid castings present many problems. All grid castings are electrically tested before leaving the foundry. Numerous factors are involved in the production cycle, mold thickness, chemical composition, temperature of the iron, and moisture content of the molding sand. Grid castings vary in thickness from 3/32 to ⅜-inch. Method of gating along the curved ends is used in all the many types and sizes. To run the lighter grid castings, only iron at a temperature of 2800 degrees Fahr. can be used.

In electrical controls the grid necessarily must be flexible and show a definite electrical resistance. Alloying at the ladle sometimes is practiced to obtain these required characteristics. Flexibility is necessary to withstand shock in use. Degree of flexibility obtained is demonstrated in Fig. 2, wherein one of these castings is shown bent through an angle of 90 degrees.

Meter box and frame castings, 3/32-inch thick, required to be readily machinable, are made successfully with the aid of a graphitizing addition at the ladle. Hot iron for running the castings also plays an important role. Design of that type of casting calls for close chemical control of the metal to guard against hard spots or hard edges on the many small bosses. Flatness of the casting face is essential. Pouring technique is important in that type of production.

Small motor castings require a quality iron to meet definite requirements for high speed machining. The outside face must be smooth to have a good finish appearance. Sand control plays a large part in the successful production of the many sizes and designs cast daily.

Cope and drag halves of lamp pole standard molds are filled from a sandslinger. Uniform mold hardness is necessary to obtain required sharp lines on the casting. Chaplets placed in drag and cope hold the core securely in place, thereby insuring uniform metal thickness in the casting. Castings up to 15 feet in length are poured from one gate at the base end. Fluidity arising from high metal temperature is necessary in this type of work.

High Temperature Essential

Because of the low phosphorus iron used at the Cleveland foundry, a high temperature is maintained to gain the desired fluidity of metal necessary to run very light section castings. Grain structure in all castings is maintained within close limits by hot melting and pouring. Close control of new sand additions maintains heaps to condition necessary for high quality work.

Confronted with the problem of making iron soft enough for automatic machining of motor bracket castings; flexible, with proper resistance qualities for grid castings; good flat iron base castings; heavy die castings; aluminum spinning form castings; growth-resisting melting pot castings; oil and pressure-tight castings, and also meeting the physical property requirements of castings such as elevator sheaves, housings, guides, and lighting pole standards, the Cleveland foundry by the use of a high silicon, low phosphorus pearlito-ferritic iron, and a low silicon, pearlitic iron, also by rigid and constant control of foundry operations has been able, with the aid of alloy additions, to meet the variety of requirements successfully.

OBITUARY

Edward William Newman, 51, for 21 years secretary treasurer, Cleveland Aluminum Castings Co., Cleveland, died June 23.

* * *

Carl Lager, 69, president, Morris Machine Works, Baldwinsville, N. Y., died recently at his summer home near Old Forge, N. Y.

* * *

John Russell, 79, formerly treasurer and later manager, Woburn Iron Foundry, Woburn, Mass., died July in a Plymouth, Mass. hospital. He was graduated from Harvard university with the class of 1882.

* * *

John J. Crowley, foundry superintendent, National Roll & Foundry Co., Avonmore, Pa., since the inception of that organization in 1909, died in New York July 12, at the age of 66.

* * *

William L. Bechtold, 42, treasurer of the New York Brass Foundry Co., New York, died June 29. He was born in Brooklyn, N. Y. and was educated in the public schools of that city. His entire business career was with the brass foundry of which his father is president.

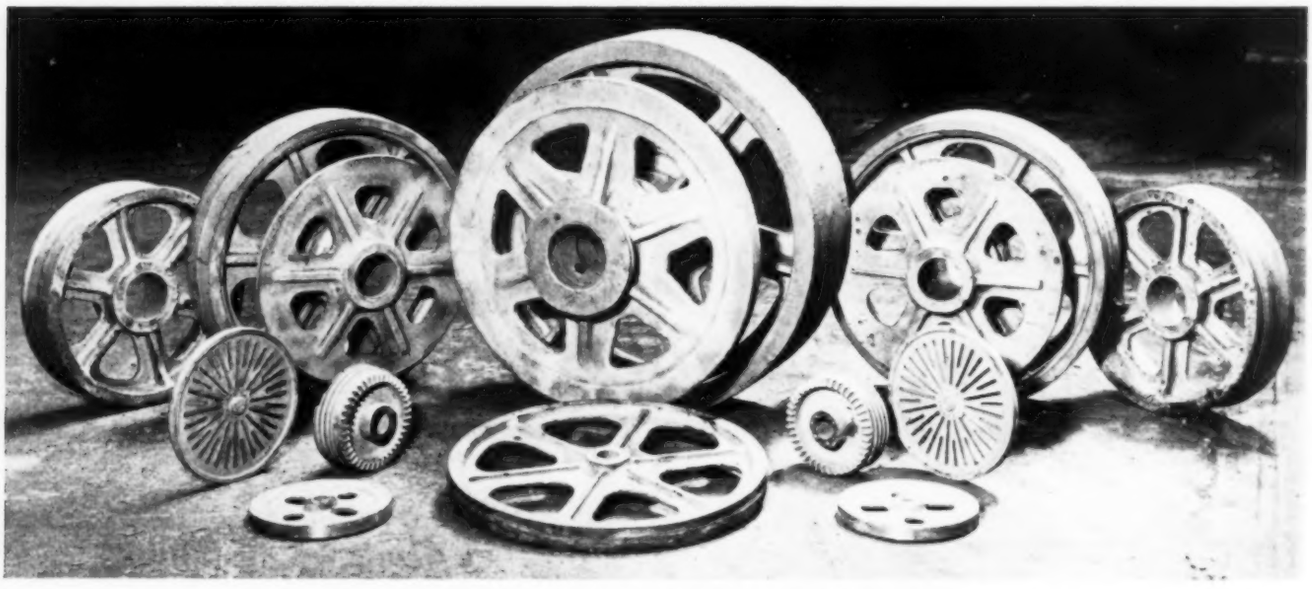


Fig. 3—Group of sheave and other similar castings have sections varying from ¾ to 3 inches

ABSTRACTS . . . . . .

FROM WORLD LITERATURE

Cupola Melting

The Laws of Cupola Melting (Die Gesetze des Kupolofenschmelzens), by H. Jungbluth, *Die Giesserei*, Duesseldorf, Germany, March 10, 1939.

According to the author each technical science in general endeavors to express results of its investigations in mathematical form, either as formulas or curves for greatest clarity and understandability, and he opens his discussion by proposing a term or symbol N_v to designate the relationship between CO_2 to CO in combustion or the formula

$$\frac{CO_2}{CO_2 + CO} \cdot 100.$$

From that he develops its application to numerous other formulas derived by various investigators from cupola observations.

Nonferrous Foundry

Nickel in the Nonferrous Foundry, by F. Hudson, *Foundry Trade Journal*, London, England, March 30 and April 6, 1939.

This article is confined to a discussion of the preparation and properties of nickel bearing gun metal containing 88 per cent copper, 5 per cent tin, 5 per cent nickel, and 2 per cent zinc. As cast the alloy has a tensile strength of about 48,000 pounds per square inch and a brinell hardness of 86, while after heat treatment the tensile strength ranges from 70,000 to 90,000 pounds per quare inch and the brinell hardness increases to 140 to 200.

In melting the author suggests use of an oil-fired crucible furnace using virgin metals with the following procedure: Melt down copper and nickel using moderately oxidizing flame; when thoroughly melted, oxidize with 3 ounces of cuprous oxide per 100 pounds of metal, stirring in well, and holding 3 to 5 minutes; deoxidize with 3 ounces of 15 per cent phosphor-copper per 100 pounds; add zinc, followed by tin, and complete deoxidation with 4 ounces of phosphor-copper.

Gas-fired Cupola

Gas-fired Cupola (Der gasbeheizte Kupolofen), by Karl Emmel, *Die Giesserei*, Duesseldorf, Germany, April 21, 1939.

Brief description of the cupola used by the author indicates that it is about 24 inches in diameter with an enlarged section in the lower part which accommodates the burner. The cupola also has a forehearth which is heated by gas, and the combustion gases of both pass through a heat exchanger for preheating the air. Only a small amount of coke is used in the base of the cupola below the melting zone to support the metal charge.

Only a few charges were melted, namely, 13 on malleable and 1 on gray iron. Of these only the last four gave satisfactory results. While the temperature of the forehearth with malleable iron had a temperature of 2840 to 2966 degrees Fahr., temperature of the metal tapped ranged from 2516 to 2606 degrees Fahr., which was attributed to heavy slag formation. With the gray iron charge the metal tapped had a temperature between 2480 and 2516 degrees Fahr. The author mentions only the most favorable figure on gas consumption of around 20 cubic meters per 100 kilograms of iron or about 6420 cubic feet per 2000 pounds.

Time and Motion

Some Notes on the Making and Application of Industrial Time and Motion Studies, by W. E. Holden, *Engineer and Foundryman*, Johannesburg, South Africa, May, 1939.

According to the author motion and time study may be defined as an analysis of methods, materials, tools and equipment used in the performance of a piece of work. Time study consists of two broad divisions of analytical work and of constructive work, and the various components of each division is outlined. Uses of time and motion study are then discussed briefly under headings of improving output rates, wage incentives, costing, estimating costs of new products, and economics of new or modified plant.

Shrinkage in Iron

Porosity and Sinking in Cast Iron, by W. West and C. C. Hodgson, *Foundry Trade Journal*, London, England, April 20, 27 and May 4, 1939.

This series of articles describes a detailed investigation to determine why porosity and shrinkage voids occur with some types of iron and not, or at least not so pronounced, with others. West and Hodgson conclude that cast irons made of pig irons from different sources may vary considerably in mechanical properties although compositions may be similar. Changes in casting temperature affect strength of some high carbon cast irons more than others; those with well marked pearlite cell walls and fine graphite being influenced less than irons with large graphite flakes. Treatment with ferrosilicon-titanium effects marked improvement in mechanical properties of low strength, high carbon cast irons. Additional treatment with carbon dioxide does not affect results to any great extent. No marked improvement was found after applying titanium treatment to medium strength irons. Castings made from irons solidifying with pearlite cellular structure are denser and less subject to internal shrinkage than those not showing that characteristic. Titanium additions assist greatly in obtaining that structure.

Brinell Hardness

Differing Cast Iron Brinell Hardnesses and Their Relation to Standardized Testing Conditions and Tested Cast Articles (Unterschiedliche Gusseisen-Brinellhaerten und ihre Beziehung zu den genormten Pruefungsbedingungen und gepruefteten Gussarten), by H. Reininger, *Die Giesserei*, Duesseldorf, Germany, May 5 and 19, 1939.

While theoretically brinell hardness determined with different size balls and proportionate loads should be in agreement, that is not usually the case, and the author carried out an extended investigation to determine the reasons for such differences and to establish if possible a relationship so that one set could be converted into terms of the others. He finally concluded that it was advisable to standardize on the 10 millimeter ball, 3000 kilogram load, and 30 seconds application. In cases where thickness, shape, etc. require a smaller ball and load, the 5 millimeter ball, 750 kilogram load, and 30 seconds application is used. Factors are employed with the latter as follow: Machine tool castings with a brinell hardness range of 125 to 155 with 10/3000/30 equals 5/750/30 plus 20; hardness range of 156 to 185 with 10/3000/30 equals 5/750/30 plus 15. Cylinder castings with a brinell range of 175 to 235 with 10/3000/30 equals 5/750/30 plus 10; hardness range of 236 to 245 with 10/3000/30 equals 5/750/30 plus 5.

Hot Blast

Cupola Melting with Superheated Hot Blast (Ueber das Kupolofenschmelzen mit ueberhitztem Heisswind), by E. Piwowarsky, *Die Giesserei*, Duesseldorf, Germany, April 7, 1939.

A discussion is presented on the theory of preheating air for the cupola blast. A description of an investigation on the effect of comparatively high temperature air for that purpose is given. For the usual type of hot blast the author gives the temperature as 290 degrees Cent. or 500 degrees Fahr., while in this work the temperature was run up as high as 600 degrees Cent. or 1300 degrees Fahr. Data gathered during the tests are presented in detail, and it was found that with higher temperature air that iron was tapped at temperatures up to 1525 degrees Cent. or 2775 degrees Fahr.; sulphur content was decreased, and the melting rate was increased considerably.

Apprentice Training

Training the Young Foundryman, by W. Gladwell, *Foundry Trade Journal*, London, England, May 18, 1939.

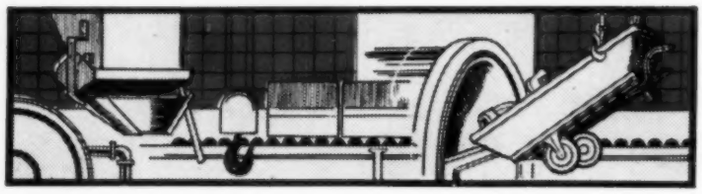
This article is a brief discussion of various phases to be considered in training apprentices, and touches upon such points as training for craftsmen, and for executives, character of entrants, foundry conditions, and an outline of a 4-year course of training.

Malleable Iron

Standard for Malleable Cast Iron, DIN-1692 (Normung Temperguss DIN-1692), *Die Giesserei*, Duesseldorf, Germany, May 5, 1939.

This constitutes the revised standard specifications for malleable cast iron in Germany, and includes data on definitions and processes; types of malleable iron which are divided into three classes constituting commercial white heart; high strength white heart, and high strength black heart; testing and delivery; test bars; heat treatment and welding; brinell hardness; magnetic properties, and shrinkage.

NEW EQUIPMENT . . .



AND SUPPLIES

Chipping Hammer

Chicago Mfg. & Distributing Co., 1928 West Forty Sixth street, Chicago, recently has introduced a new type chipping hammer shown

in the accompanying illustration and designed for chipping gray iron and malleable iron castings. It is claimed the combination drift and chisel form an ideal combination for chipping castings at any angle in close quarters. Approximate weight of the hammer is 14 ounces, overall length 11 inches, head ⅞ x 5 inches properly drawn out to a chisel and drift point. The hammer head is high grade tool steel, heat treated to withstand the most severe service.

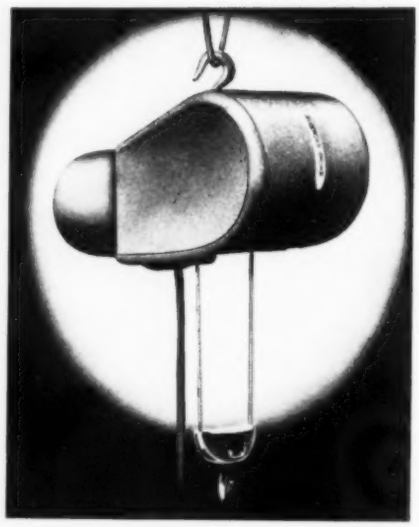
Welding Hose

Hewitt Rubber Corp., Buffalo, is producing a new type of hose for oxyacetylene welding and cutting work. It consists of two lines of flexible, cord-reinforced welding hose molded into a single unit. It is claimed that the hose will not kink or writhe and twist under high pressure. Individual passages have an inner lining of nonblooming, gas-resisting compound which is cord-reinforced. Carcass is made to resist pressures many times greater than those incident to welding service.

The new hose is available in any desired cut length or in continuous lengths as long as 500 feet. Hose is installed by splitting along the joint line at each end a sufficient distance to form a convenient "Y" at both tank and torch ends. After separation, ferrules supplied with the hose are crimped to prevent permanently any further separation of the two hoses.

Electric Hoist

Conco Engineering Works division of H. D. Conkey & Co., Mendota, Ill., recently has placed on the market the completely enclosed, cable and drum type electric hoist, shown in



the accompanying illustration and featuring double drum construction, push button control, electric brake and heavy duty construction throughout. The new hoist is available for either lug, hook, or trolley suspension in capacities from 250 to 1000 pounds.

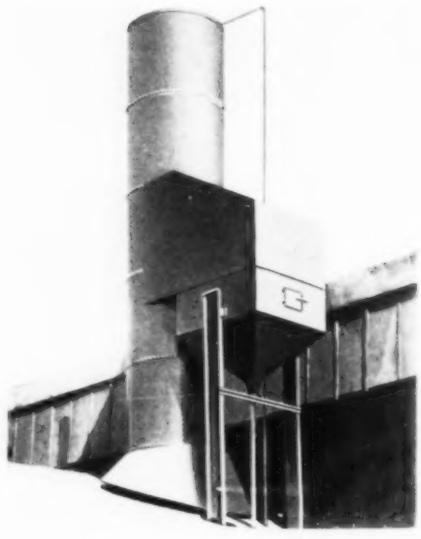
Hoist mechanism is fully enclosed in an oil tight, weather proof dust housing. Only two gear reductions are employed, one worm and one spur gear. The spur gears are high carbon steel, worm gears are chilled phosphor bronze and the worm forged steel. All gear shafts operate on anti-friction bearings with gears and shafts fully enclosed in an oil bath. Cast iron right and left hand drums, 30 times cable diameter are machine grooved. A minimum factor of safety of 8 is provided for cables on all hoists. The double drum construction with cables on either side of the load hook centers the load and holds it in perfect balance. Other features of the hoist include a single pole paddle type limit switch, electric brake of spring set, disk type operated by a heavy duty solenoid connected to a control circuit, a reversible motor that can be removed with the hoist under load, roller and radial thrust bearings throughout.

Spark Collector

Whiting Corp., Harvey, Ill., has developed a spark collector and gas washer for application to the top of the cupola, as shown in the accompanying illustration. It is claimed that this device captures about 95 per cent of the total solids coming up the stack. The material is washed down to the track receiver thus eliminating the dirt nuisance and fire hazard from falling sparks.

On a cupola with a shell diameter of 63 inches it is claimed that about 10 pounds of solids are collected for every ton of iron melted. Material

(*Continued on page* 94)



"I'M A BLAST CLEANING OPERATOR

. . . . and I take pride in my work. I KNOW from EXPERIENCE most of the things you higher-ups READ ABOUT. I know HOW to get good production from our blast-cleaning equipment and I know HOW to keep the cost DOWN. If I didn't, I'd soon lose my job.

"But there's no WORRY about THAT! The boss and I both agree on the one thing that does most to keep costs down and quality up . . . . 'CERTIFIED' Steel Abrasives! Through many years of trial we are convinced that in using 'CERTIFIED' Steel Grit for a matte finish on metallizing, enameling or plating jobs—and 'CERTIFIED' Steel Shot for work where the rolling or ball-pein hammer action is required—will save any shop real money. Save power, compressed air, rejects, dust trouble, and labor. I KNOW, Mister, because I use 'CERTIFIED' Abrasives EVERY DAY."

GRADED TO UNIFORM DEPENDABLE SIZES FOR EVERY NEED

PITTSBURGH CRUSHED STEEL CO.
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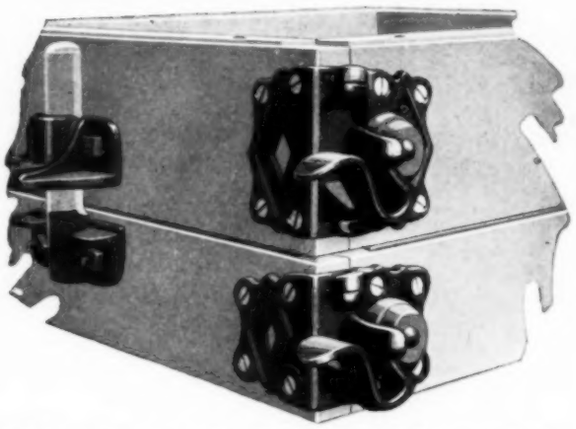
STEEL SHOT AND GRIT CO.
BOSTON, MASS.



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HARD WOOD WEDGES

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CORE and MOLD OVENS

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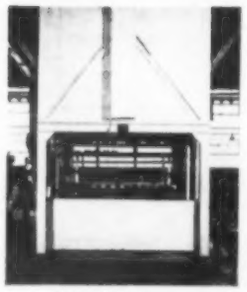
ARE OUR BEST "SALESMEN"

Carl-Mayer has made many outstanding installations because of achievement in core and mold oven design. We can refer you to customers who are the "who's who" in modern production.

Ovens of all types—Vertical, Horizontal or Monorail types; Rack, Car and Shelf types, etc.



Vertical Oven.

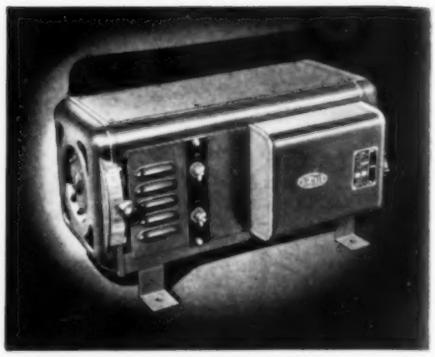
The CARL-MAYER Corp.
3030 Euclid Ave., CLEVELAND, OHIO.

(*Continued from page* 92)

ranges in fineness from 25 per cent retained on a 35-mesh screen to 8 per cent through a 270 mesh screen. All smoke and gaseous matter pass through three separate water curtains. At no time is there a flame from the top of the stack. Water for washing and quenching is supplied at city pressure and no blower or pump is needed. A valve is opened at the beginning and closed at the end of the heat. The only labor required is to remove the solids from the settling tank. It is claimed that cost of operation is practically negligible.

Welder

Harnischfeger Corp., 4400 West National avenue, Milwaukee, has introduced a new model welding unit, shown in the accompanying illustration, a square framed welder for multiarc welding service. The unit requires less than 3½ square feet floor space and offers a welding range from 40 to 225 amperes. It can be mounted on legs or on wheels. Spring mounted louvers can be snapped off and on for periodical inspection of brushes, commutator or for minor adjustment. Top and plates also are easily removed.



The rotating member is statically and dynamically balanced and vibration is noticeably absent. Where an exceptionally wide range is desired, welders may be hooked in parallel without special adjustments to gain any desired welding amperage.

Fire Blanket

A fireproof blanket mounted so that it can be wrapped tightly around one's body in a few seconds without assistance is being marketed by the Davis Emergency Equipment Co., 55 Van Dorn street, New York, for protection of laboratory and industrial workers. Normally the blanket is wound on a vertical roller, which is mounted on a wall or post. For use the worker thrusts an arm through the catch rope attached to the exposed edge of the blanket and, turning rapidly, wraps the blanket closely around himself to extinguish flames in his clothing or protecting himself from burns. The blanket is made of fireproof and mothproof wool. It is large enough to cover a large man completely since it is 80 inches long. The blanket is said to be replaced easily on its roller and takes up little room. It also is suitable for extinguishing small fires by smothering.

Electric Sander

Chicago Pneumatic Tool Co., 6 East 44th street, New York, recently has developed a 2-speed sander, shown in the accompanying illustration, which features finger tip gear shifting. Instead of a separate gear shift lever and a starting switch to manipulate, a plainly marked button for each speed is located in the switch handle. Two corresponding sets of gears always are in mesh with the driving pinion. When the selected button is pressed the speed is changed electrically without loss of power and efficiency. Failure to change to the correct speed before starting is avoided because the operator shifts as he starts and starts as he shifts.

Standard equipment includes 9 inch abrasive disks for general metal sanding. A disk cutter also is sup

SLOSS IRON MAKES GOOD CASTINGS

There are quite obvious reasons why Sloss Foundry pig iron makes your percentage of good castings higher. They go back to the smelting of the iron.

Charged with scientifically blended Sloss ores, a Sloss blast furnace discharges molten iron into a specially designed 125-ton mixing ladle. This thorough mixing is an exclusive Sloss feature. It means that Sloss Foundry iron is absolutely uniform in chemical analysis and physical properties.

Sloss furnace men are steeped in the tradition that foundry iron is a special raw material—not a by-product. These men are "foundry iron conscious". They make nothing but foundry pig iron—iron that produces better castings in your plant.

A Sloss Shirt-Sleeve Service Man will cooperate with your staff so you may benefit immediately from the advantages of Sloss Foundry iron. Address inquiries to Sloss-Sheffield Steel & Iron Company, Birmingham, Alabama.

SHIRT SLEEVE SERVICE

SLOSS

SPECIALISTS IN FOUNDRY IRON

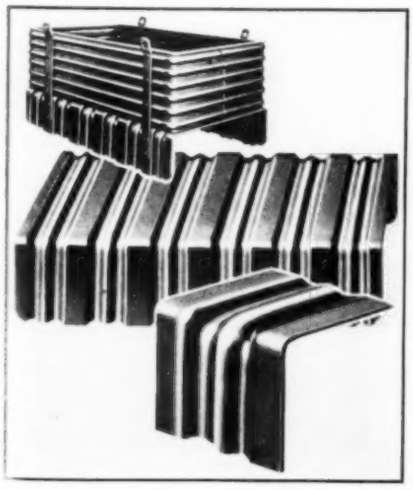
LADLE MIXED FOR UNIFORMITY

plied for cutting the worn 9-inch disks down to 7 inches. Structural features of this and of other types of electric sanders made by the

company include: High torque, high power, cool running motor; powered to maintain efficient cutting speed and notable disk economy; finger tip gear shifting; semienclosed, fan cooled motor; straight line air flow ventilation; totally enclosed switch; 3-conductor cable provides safety ground wire; cable protector in wide bend; wood handle interchangeable for right or left hand. The sander can be supplied for 32 volts or on special order for 250 volts.

Skid Platform

Union Metal Mfg. Co., Canton, O., is producing a new all steel lift truck platform with double corrugations, as shown in the accompanying illustration. The platforms are available in all customary variations, including a complete line of steel corrugated platform boxes. The platform corrugation consists of two half round recesses joined by a raised center rib. Both recesses and raised rib traverse the entire deck of the platform, rolling over the knee in a gradual curve and down the legs. It is claimed that this construction gives exceptional strength at the knee where the usual point of failure occurs; that in flowing over the bend, the center rib acts as a knee brace or gusset; that in traversing the deck it acts as an integral bar brace; and that in the legs it acts as a bar brace stiffener. The company originally organized in 1906 to manufacture fluted steel columns, later branched out into the manufacture of a wide line of related objects, including lamp standards, steel piling and heavy and light gage tapered poles.



Cutting Attachment

A new oxy-acetylene cutting attachment has been developed by the Linde Air Products Co. unit of Union Carbide & Carbon Corp., New York, which is useful for shops where the amount of cutting does not justify purchase of a separate cutting blowpipe. The cutting attachment which is termed type CW-23 is claimed to cut any thickness of steel up to 8 inches. Due to a new, improved injector principle, it operates with accurate control of gases, and performs equally well with low pressure or medium pressure acetylene. The cutting attachment can be used with either the W-17 or W-22 welding blowpipes made by the firm.

Metallizing Co. of America, Inc., recently has opened a sales and service office at 602 Academy building, Newark, N. J., in charge of William McMakin.

Welded
BOX GIRDER
CRANES

SHEPARD NILES
also manufactures
- Transfer Cranes
- Grab Bucket Cranes
- Gantry Cranes
- Ice Plant Cranes
- Single I-Beam Cranes
- Jib and Bracket Cranes

• In this type of crane the rugged box section girder is formed by welding together the flanges of two wide flange I-Beams which are diaphragmed at regular intervals through their entire length.

Capacities—Welded Girder—1 to 15 tons.
Riveted Girder—up to 450 tons.

Standard Shepard Niles Crane Trolleys with their balanced drive gearing, oil bath lubrication, compact design, interchangeable unit construction are available for welded box girder cranes.

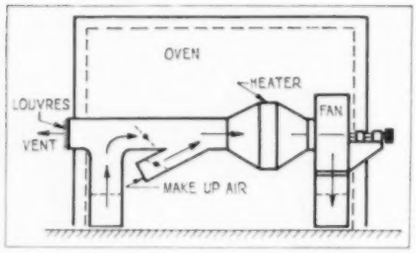
A COMPLETE LINE OF CRANES & HOISTS

SHEPARD NILES CRANE & HOIST CORP.

360 Schuyler Avenue . . . MONTOUR FALLS, N. Y.

Oven Heater

Dravo Corp., Dravo building, Pittsburgh has developed a duct type heater shown in the accompanying illustration for forced circulation of



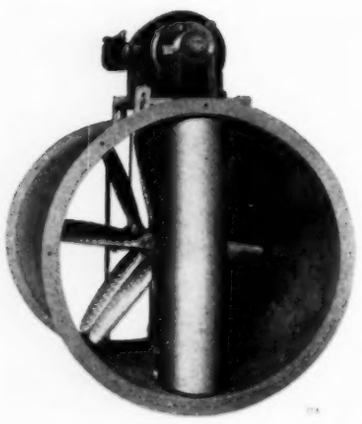
hot air in foundry mold and core drying ovens. Claims made for the heater include savings in time, labor, fuel and maintenance of uniform temperature. The heater is fired with gas using the known Maxon line burner elements suspended in the circulatory air stream. It is claimed the short flame produced is not affected by the air stream.

No brick work is involved. Outlet temperatures go up to 800 degrees Fahr., and volume ranges from 40,000 to 10,000,000 B.t.u.'s per hour and larger. Where mixing the products of combustion with the air stream is undesirable an indirect type heater is available. Where oil fuel is used, direct and indirect type heaters are supplied.

Propeller Blower

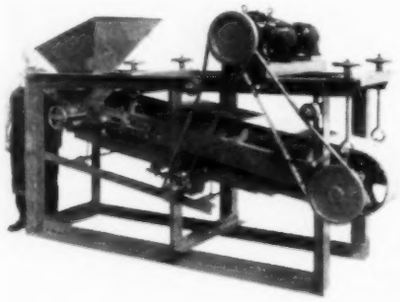
Hartzell Propeller Fan Co., Piqua, O., has designed a new propeller type blower with motor located on top of the blower housing, entirely out of the air stream, as shown in the accompanying illustration. That type blower, it is claimed, meets the demand for a propeller type blower which can be used for moving air at high temperature, or in which the presence of acids or other materials might damage the motor.

The motor platform on top of the housing is hinged at one side. Lock bolts on the opposite side can be adjusted to tighten or loose the belt or to change it. A v-type belt connects the motor and fan shaft. This belt can be replaced from outside the blower. The belt is protected on the inside by a steel guard. It is claimed the propellers give high air deliveries against heavy back pressure. The blower is available in twelve standard sizes with propellers from 18 to 48 inches in length. Special sizes may be built to order to meet special conditions.



Magnetic Separator

Dings Magnetic Separator Co., 675 Smith street, Milwaukee has developed a new magnetic unit for separating babbitt metal from steel turnings, or other similar combinations of magnetic and non-magnetic materials. The accompanying illustration shows an endless belt running above a vibrating shaker tray. Mounted between the belt pulleys is a series of powerful electro magnets. Material is fed through a hopper into the tray which provides sufficient agitation to disentangle the magnetic and nonmagnetic particles.



The magnetic particles are pulled up to the under side of the belt and held there by magnetic attraction until they pass out of the magnetic field, at which point they drop off. The nonmagnetic particles drop off the end of the tray just back of the point at which the magnetic particles are released.

Respirator

Willson Products Inc., 262 Thorn street, Reading, Pa., has developed a mechanical filter respirator, shown in the accompanying illustration, and approved by the bureau of mines for protection against fumes of metals such as lead, mercury (except mercury vapor) manganese, magnesium, aluminum, antimony, arsenic, copper, chromium, iron, cadmium and zinc resulting from sublimation or the condensation of their vapor, or from the chemical reactions between their vapors and gases.

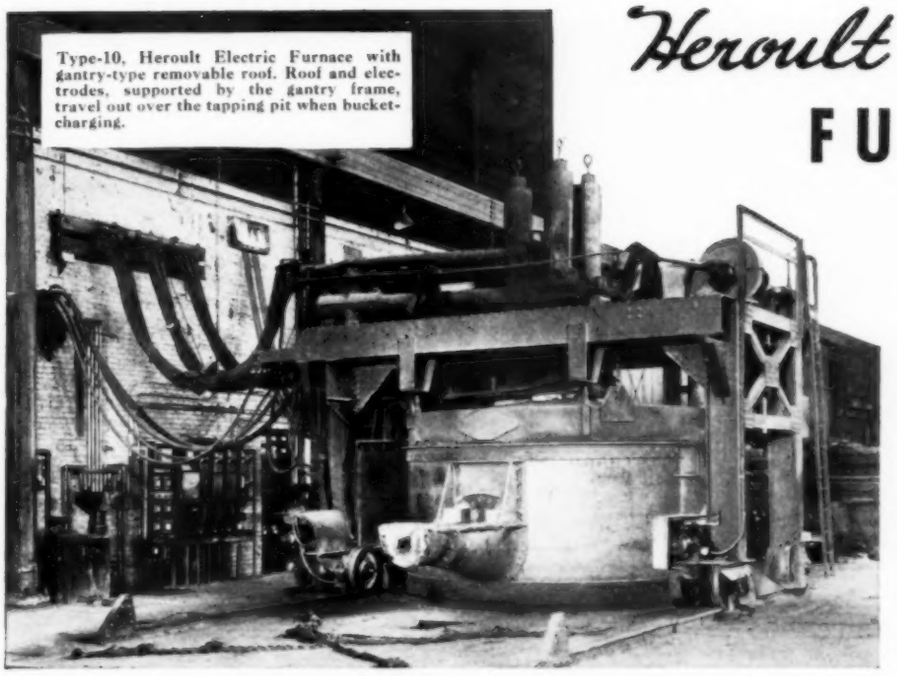
The rubber face mask fits snugly under the chin and an air tight contact is obtained with but slight tension on the adjustable double elastic head band. Exhalation of used air through a properly placed exhaust valve is aided by twin inhalation valves in the mask interior. Filters may be cleaned regularly and all parts are economically replaceable.

Portable Flares

Alexander Milburn Co., 1416 West Baltimore street, Baltimore, Md., recently has added three portable flare lights to its line of portable carbide lights. One is designed for use with 10 cubic foot capacity acetylene tanks, and is equipped with a 10-inch aluminum reflector, tank connection, swing joint and stand pipe. Height of the attachment is 12 inches to center of burner; overall height including tank is 30 inches.

Another is designed for use with 40 cubic foot capacity acetylene tanks and is equipped with a 13-inch aluminum or porcelain reflector, tank connection, swing joint and stand pipe. Height of attachment is 18 inches to center of burner; overall height including tank is 40 inches. The third, designed for use with standard 150 cubic foot capacity or larger acetylene tanks, is equipped with a 13-inch aluminum or porcelain reflector, tank connection, swing joint, gas cutoff cock and stand pipe. Height of attachment to center of burner is 28 inches; overall height when used with standard 150 cubic foot acetylene tank is 66 inches.

Civil service examinations for senior inspector, inspector, associate inspector, assistant inspector and junior inspector of ordnance material will be held shortly. Application must be on file with the civil service commission at Washington August 14.



Type-10, Heroult Electric Furnace with gantry-type removable roof. Roof and electrodes, supported by the gantry frame, travel out over the tapping pit when bucket-charging.

Heroult ELECTRIC FURNACES

AMERICAN Bridge Company offers an improved series of Heroult type electric furnaces especially designed for effective melting and refining of ferrous materials, and particularly suited to produce high-grade alloy and stainless steels, iron or steel castings.

Heroult Furnaces are sturdily built, and equipped with the most modern electrical and mechanical appliances for efficient, economical and safe operation. Dependent on size and operating conditions, they are adaptable to hand, chute, machine or overhead drop-bottom bucket charging. Available capacities range from ½ to 100 tons.

You are invited to call freely upon the specialized experience of our furnace engineers.

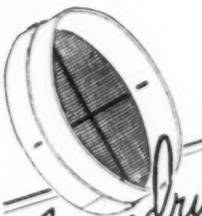
AMERICAN BRIDGE COMPANY

General Offices: Pittsburgh, Pa.

Offices in New York, Philadelphia, Chicago and other principal cities.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



Foundry RIDDLES

HERE is a foundry riddle that will stand the "gaff" because it has been constructed and *designed especially for foundry use.* "Buffalo" riddles are noted for long life and the ability to do faster, cleaner work. It will pay you to try *Buffalo's* the next time you buy riddles.

Available in three stock sizes: 16", 18" and 20" diameter with mesh of either steel, galvanized, tinned or brass wire cloth, supported by two, three or four wires as specified. Ask Us For New Folder No. 91-B

"We are not connected with any other wire weaving company in New York State or any other part of the United States."

Buffalo WIRE WORKS Co., Inc.
425 TERRACE, BUFFALO, NEW YORK
Branch Office & Warehouse: 11 South 7th St. Philadelphia, Pa.

CLEVELAND

New *COILED HEAD* Shoulder Radiator Chaplet.

This exclusive patented chaplet (formed from one piece of metal, with reinforcing rib) is proving its super value in automotive, stove, and a great variety of foundry work. Sand packs around it better, insuring a sound core support. It is easier to handle—and the COILED HEADS will NOT nest. Made in plain, electro-copper plated, and hot tin-dipped finishes. WRITE FOR SAMPLES.

CHAPLETS
all types, sizes --since 1890

CLEVELAND CHAPLET & MFG. CO.,
W. 67th St. and N.Y.C. Ry., CLEVELAND, OHIO

FOUNDRY ACTIVITIES

A $50,000 addition to the Marion Malleable Iron Works, Marion, Ind., was dedicated recently with a program and dance in the new brick structure. Machinery was installed in the new addition the following week.

* * *

Victoria Metal Co. Twentieth and Haybarger streets, Erie, Pa., has been granted a permit to build an addition to the existing building at a cost of $6,000. Baeder and Scheu are the contractors.

* * *

Three hundred employes of the Enterprise Foundry Co. Belleville, Ill., have agreed to supply $175,000 working capital for the company in return for assurances that the organization will stay in business in Belleville for at least 10 years and will make no wage reductions during that period. Employes will receive interest bearing bonds secured by a mortgage on the company's plant maturing in 5 to 10 years. Money will be used for development of new business.

* * *

Plant of the Lancaster Malleable Castings Co., Lancaster, Pa., suffered extensive damage by fire on July 4.

* * *

John A. Norwell, operating the Universal Brass Foundry, 1523 West Hubbard street, Chicago, has purchased the property from William J. Kehl.

* * *

Ireland's Foundry, Inc., 1725 Maypole avenue, Chicago, has been organized by L. C. Ireland, D. Howell and L. C. Ireland, with 200,000 shares of stock. The company will carry on a general foundry, pattern and machine shop business.

* * *

Columbus Co-Op Foundry, specializing in gray iron castings, has been placed in operation at 310 West Poplar avenue, Columbus, O. Officers include: President, Leo Mencer; vice president Leonard

(*Concluded on page* 100)

Why are Truscon Foundry Flasks popular with experienced molders? Note several reasons: *First,* Truscon Steel Flasks are easily rammed and shaken out. *Second,* every Truscon Flask is easy on the muscles because there isn't an ounce of unnecessary weight to handle. *Third,* Truscon Flasks are built to stand the hard knocks of continuous service.

Write for illustrated catalog which gives you all facts about the best flasks for YOUR needs.

TRUSCON STEEL COMPANY • FOUNDRY FLASK DIVISION
6100 TRUSCON AVENUE • CLEVELAND, OHIO
SUBSIDIARY: Republic Steel Corporation

TRUSCON
COPPER-BEARING STEEL FOUNDRY FLASKS

RAW MATERIAL PRICES
July 24, 1939

Iron	
No. 2 foundry, Valley	$21.00
No. 2 Southern Birmingham	17.00
No. 2 foundry, Chicago	21.00
No. 2 foundry, Buffalo	21.00
Basic, Buffalo	20.00
Basic, Valley	20.50
Malleable, Chicago	21.00
Malleable, Buffalo	21.50
Charcoal iron, furnace	25.00
Coke	
Connellsville beehive premium	$5.50 to $6.30
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	10.25
Scrap	
Heavy melting steel, Valley, No. 2	$14.00 to $14.50
Heavy melting steel, Pittsburgh, No. 2	14.00 to 14.50
Heavy melting steel, Chicago, Auto No. 2	10.50 to 11.00
Stove plate, Buffalo	11.50 to 12.00
Stove plate, Chicago	7.75 to 8.25
No. 1 cast, mchy., New York	11.00 to 11.50
No. 1 cast, mchy., Chicago	12.00 to 12.50
No. 1 cast, Pittsburgh	15.00 to 15.50
No. 1 cast, Philadelphia	16.00 to 16.50
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	14.50 to 15.00
Car wheels, iron, Chicago	13.50 to 14.00
Railroad malleable, Chicago	15.00 to 15.50
Malleable, Buffalo	14.00 to 14.50
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.87½
Straits tin	48.45
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	11.75 to 12.00
Lead, New York	4.85
Antimony, New York	12.00
Nickel, electro	55.00
Zinc, East St. Louis, Ill.	4.50

EVERY DOLLAR invested in a PANGBORN-NORBIDE* nozzle will pay you a handsome profit. Lined with the hardest substance made by man for commercial purposes, these nozzles will outlast the ordinary cast iron type as much as 1500 to 1! A size and shape for every blast cleaning requirement. Write today for data.

*Trade-mark of Norton Co. for Boron Carbide.

PANGBORN CORPORATION
The World's Largest Manufacturer of Blast Cleaning and Dust Collecting Equipment
HAGERSTOWN • • • • MARYLAND

Produce Better Alloys Faster and Cheaper With

HAUSFELD

Gas and Oil Fired

MELTING FURNACES

Write for Complete Catalog of Single Burner and Multiple Burner, Tilting and Stationary Crucible and Non-Crucible Furnaces.

THE CAMPBELL-HAUSFELD CO.
300-320 Moore Street Harrison, Ohio

COMB'S GYRATORY RIDDLES

Greatly Reduce Riddling Costs Through Speed and Labor Saving

Available in four types and sizes, Comb's Gyratory Riddles are noted for their low maintenance cost (½c to 1c per hour) and their enormous capacity.

• • •

30 DAYS FREE TRIAL

Write for descriptive catalogue; choose the type best suited to your needs and use it for 30 days. We pay the freight both ways if you decide to return it!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas

Another job done better with Curtis Air Cylinders

Operating oven-door at Buffalo Plant

Curtiss-Wright Corporation uses Curtis Air Cylinders at Buffalo and St. Louis Plants

The simplicity and dependability of Curtis Air Cylinders make them ideal for many lift, push or pull operations (as in this Curtiss-Wright installation), since interruption of production schedules to make repairs must be minimized. Under such conditions, Curtis Air Cylinders give unfailing service because of their rugged construction and simple design (only one moving part).

The installation cost of Curtis Air Cylinders or Hoists is small, and power consumption low, using regular shop air lines. Accurate control is assured, and there is no risk of injury from overload or bad atmospheric conditions. Because of their efficiency, negligible maintenance expense and long life, important savings are almost inevitable wherever they can be used.

Check your plant to see where Curtis Air Power Cylinders can be applied to increase efficiency. Our new 28-page booklet, "How Air is Being Used in Your Industry" will give you helpful suggestions. Just send in the coupon—no obligation.

CURTIS Compressors • Air & Hydraulic Cylinders Air Hoists • I-Beam Cranes & Trolleys

CURTIS PNEUMATIC MACHINERY COMPANY
1922 Kienlen Avenue, St. Louis, Missouri
Gentlemen: Please send me the new 28-page booklet, "How Air is Being Used in Your Industry."

Name _____ Street _____
Firm _____ State _____
City _____

(*Concluded from page* 98)

Laurence; treasurer and general manager Charles Oliver; office manager Justin L. McCarthy; foreman Edward Kirby.

* * *

Frank Hamachek Machine Co., Kewanee, Wis., is constructing a one story fireproof coke and sand shed 24 x 50 feet to be used in connection with the foundry department. The company manufactures green pea and lima bean hulling machinery.

* * *

Los Angeles Foundry Co., has been organized as a new corporation in Los Angeles county with 2000 shares of capital stock. Directors are Henry Chamberlain, Beverly Hills, Calif.; Stuart M. Salisbury, Los Angeles; and C. M. Gregg, Glendale, Calif. The company is represented by Salisbury, Robinson & Himrod, 840 Roosevelt building, Los Angeles.

* * *

H. W. Barney, formerly connected with the Grand Forks Foundry Co., has organized the East Grand Forks Iron Works, 619 De Mers avenue, East Grand Forks, Minn. The firm is equipped to do the usual types of foundry and welding work and specializes in repair of farm machinery.

* * *

Ohio Steel Foundry Co., Lima, O., will build a roll shop 190 x 220 ft., as shown in the accompanying illustration. The new roll shop presented some interesting design problems rising from the inter-relation of crane operations. Albert Kahn Inc., Detroit, is architect and engineer.

* * *

Index of foundry equipment orders for June, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 134.6 as compared with 108.8 in May and 61.2 in June, 1938. Index of shipments was 148.5 as compared with 144.3 in May and 78.5 in June, 1938.

Stearns

~~COOL~~ Because it's Ventilated

Magnetic Pulley

"Stearns magnetic pulleys are an important part of our sand conditioning operations. We are well satisfied with their performance. They operate efficiently and economically and have needed no attention since they were installed eight years ago."

Bill Grede of Spring City Foundry, Waukesha, Wis., speaking. Bill knows good magnetic pulley construction. That's why he's sold on Stearns, and that's why he says further, "And I feel the same about the Stearns pulleys in our Liberty Foundry in Milwaukee."

Stearns air cooled, improved magnetic pulleys give you a positive, automatic, economical, labor and time saving method of reclaiming iron in your sand conditioning department. Made in a wide range of sizes to fit your conveyor system or in self-contained unit—all sizes for moving from place to place.

We will be glad to mail this folder and our Bulletin 301 on Magnetic Pulley Separators. Write for them.

STEARNS MAGNETIC MANUFACTURING CO.
662 S. 28th St., Milwaukee, Wis.

STEARNS-MAGNETIC MILWAUKEE

Trade Publications

AIR FILTER—Electric air filter produced by American Air Filter Co. Inc., Louisville, Ky., is described in bulletin No. 250 which was recently issued. Principles of design and operation are described and illustrated. Other types of equipment manufactured by the company are illustrated as well.

AIR RECEIVERS—A folder recently published by the Ingersoll-Rand Co., 11 Broadway, New York, describes air receivers available for maximum pressures of 125 to 500 pounds.

GAS GENERATORS—Roots Connersville Blower Corp., Connersville, Ind. has issued bulletin describing and illustrating its line of inert gas generators.

ALLOYS—Haynes Stellite Co., Kokomo, Ind. has issued a booklet which presents the physical mechanical and chemical properties of the company's alloy products together with brief descriptions of each.

ROOF COATING—Flexrock Co., Twenty-third and Manning street, Philadelphia, has issued a folder describing longlife, roofing material for waterproofing, low cost factory caulking and many other purposes.

CORE OVENS—Ferdinand G. Schultz Co., P. O. Box 7909, Pittsburgh has is-

(*Concluded on page* 102)

Copies of any of the literature listed here may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

The Ideal Material for Sand Blasting

. . . . . it cleans fast
. . . . . *at reduced cost*

FLINT SHOT gives a class of finish impossible to duplicate with any other forms of abrasives. Its round, pearlike granules are as hard and sharp as flint. Does not split up, only wears down and can be used over and over again many times. It flows freely, requiring less air power. FLINT SHOT LASTS. Relatively dustless.

Try FLINT SHOT and you'll be convinced.

Engineering Service Gratis.

Three plants to meet your needs with dispatch.

Washed, Dried and Screened Special Sands for
Steel Moulding
Furnace Bottoms
Cores, Openers
And Silica Flour

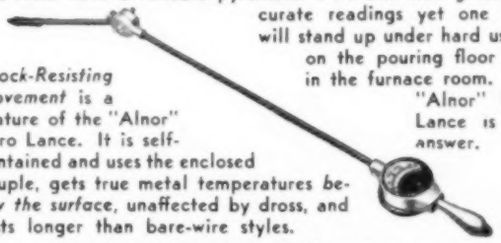
OTTAWA SILICA COMPANY

Ottawa, Illinois

NON-FERROUS FOUNDRYMEN AGREE . . .

A Reliable Pyrometer is Indispensable

For sound non-ferrous castings . . . and for lower costs . . . you must have a reliable pyrometer . . . one that gives accurate readings yet one that will stand up under hard usage on the pouring floor and in the furnace room. The "Alnor" Pyro Lance is the answer.



Shock-Resisting Movement is a feature of the "Alnor" Pyro Lance. It is self-contained and uses the enclosed couple, gets true metal temperatures *below the surface*, unaffected by dross, and lasts longer than bare-wire styles.

Send for illustrated bulletin and prices.

ILLINOIS TESTING LABORATORIES, INC.
418 N. La Salle St. Chicago, Ill.

GIFFELS & VALLET, INC.

FOUNDRY ENGINEERS

SURVEYS

Operating Cost Studies — Investigations—Reports — Suggestions & Recommendations for Modernization & Labor Saving Equipment.

LAYOUTS AND DESIGNS

Buildings & Equipment — Material Handling — Labor Saving Devices — Dust & Smoke Collection — Specifications — Estimates — Complete Engineering Service By Large & Experienced Staff.

1000 MARQUETTE BLDG. DETROIT, MICH.

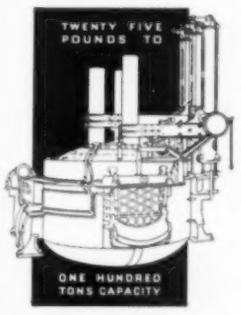
THE JACKSON IRON & STEEL COMPANY

Manufacturers of

"JISCO"

SILVERY
PIG IRON SPECIALTIES

JACKSON OHIO



Moore Rapid
Lectromelt
Furnaces

Door charge and top charge types of furnaces for rapid and economic production of gray and malleable irons and carbon and alloy steels.

PITTSBURGH LECTROMELT FURNACE CORP.
PITTSBURGH, PA.

(*Concluded from page* 100)

sued a folder describing and illustrating its newly developed bench type core ovens. The folder illustrates the two types of ovens available.

GATES — Cornell Iron Works Inc., Thirty-sixth avenue and Thirteenth street, Long Island City, N. Y., has issued a folder illustrating its sliding and rolling grille gates.

DIESELS — Caterpillar Tractor Co., Peoria, Ill., has issued an 11-page booklet illustrating the application of its diesel engine in connection with electric generators. The illustrations show installations for a wide variety of uses.

WASHROOM SERVICE — Scott Paper Co., Chester, Pa., has issued a 5-page booklet giving helpful hints and points to be watched in furnishing rest rooms. Points covered are placement of mirrors, ventilation, washing facilities, types of floors, etc.

MACHINE TOOLS — George Scherr Co., 128 Lafayette street, New York, has published recently a general catalog showing the complete line of machine tools, instruments and machinery handled by that organization.

VACUUM CLEANING—Spencer Turbine Co., Hartford, Conn. has issued a 19-page bulletin, No. 120, describing its equipment for vacuum cleaning industrial plants. A section is devoted to its application in foundries.

ROTARY FURNACE—Foundry Equipment Ltd., Linslade Works, Leighton Buzzard, Beds., England, has issued a folder describing its rotary furnace, including construction and operation. Specifications are also given.

FLEXIBLE SHAFTS—Stow Mfg. Co. Inc., Binghamton, N. Y., has issued a supplement to the catalog on standard flexible shafts and shaft equipment. This supplement illustrates in actual size and shape the burs manufactured by that company.

CONVEYORS—"Conserve Human Energy" is the title of a folder issued recently by The Cleveland Crane & Engineering Co., Wickliffe, O., to describe the application of tramrail in modern industry. Illustrations show its diversified application.

COATINGS — Technical Protective Coatings Inc., 3248 Long Beach boulevard, Los Angeles, Calif., has published 27-page book describing its recently developed products for protecting all types of surfaces from all types of corrosion.

LADLES—Whiting Corp., Harvey, Ill. has issued a 24-page booklet No. 229 which describes and illustrates the pouring ladles manufactured by that company. Tables of capacities for iron and steel in the various size ladles are given together with diagrams of the construction.

MAINTENANCE—A handbook covering all phases of building maintenance, that is repairing of floors, ceilings, cleaning of painted surfaces, roof repair, etc., are described and illustrated in a 56-page book prepared by the Flexrock Co., 2300 Manning street, Philadelphia. An index is included.

MONEL METAL—Development and Research division, International Nickel Co. Inc., 67 Wall street, New York, has published bulletin T-5 entitled, "Engineering Properties of Monel." The bulletin contains 12 pages covering in detail the various engineering properties of that metal.

HOISTS—Chain hoists manufactured by the McCollum Hoist & Mfg. Co., Downers Grove, Ill. ranging in size from ¼ to 6 ton capacities are described in a folder recently issued. Specification tables also are included. Electric hoists manufactured are illustrated and described in a second folder.

GOGGLES—A well illustrated 8-page bulletin on eye protection has been published by Mine Safety Appliances Co., Thomas and Meade streets, Pittsburgh. A complete line of goggles and spectacles, welding helmets and shields, combination hats with welding shields or goggles and additional new items are described.

CORE MACHINE—American Foundry Equipment Co., 555 South Byrkit street, Mishawaka, Ind., has revised bulletin No. 50. This bulletin illustrates and describes construction features and mechanical details of the core machine and lists specifications and operating data. Included are operating views of typical installations in leading foundries throughout the country.

DUST COLLECTOR—A new illustrated circular published by the American Foundry Equipment Co., 555 South Byrkit street, Mishawaka, Ind. gives complete information on dust collectors made by that company. Mechanical features and the construction of equipment are explained by drawings and illustrations. Specifications of all models are completely listed.

MOTORS—A new leaflet No. 2183-A entitled "Lo-Maintenance Direct Current Motors Generators", has been released by the Allis-Chalmers Mfg. Co., Milwaukee. The equipment is described and illustrated and details of construction are explained. "Explosion-Proof Motors", a special leaflet on motors that give protection in explosive, fume-laden atmospheres, also has been published by that company.

CLEVELAND TRAMRAIL

OVER HEAD HANDLING EQUIPMENT

● A view of hand operated cranes of one ton capacity, 34 feet overall length; with hand power carriers and pouring devices for pouring small molds.

ALSO BUILDERS OF CLEVELAND CRANES ALL WELDED

CLEVELAND TRAMRAIL

DIVISION OF

THE CLEVELAND CRANE & ENGINEERING CO.

1155 Depot St.

WICKLIFFE, OHIO.

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